FACTORY

MANAGEMENT AND MAINTENANCE

MARCH 1949

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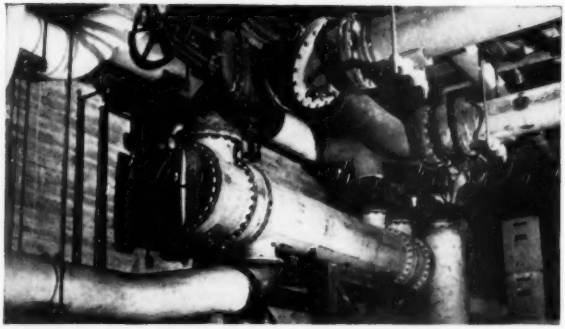
A McGRAW-HILL PUBLICATION

The modern approach in curbing



Corrosion

. . . in condensate returns
. . . in cold and tempered water lines
. . . in the vacuum priming system
. . . in condenser water lines
. . . in condensate tanks

BYERS WROUGHT IRON PIPE

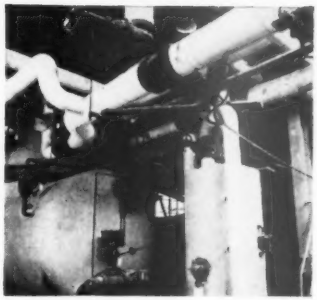
Here's a different kind of "cotton plant" than is usually meant by the term—a great new project of Springs Cotton Mills at Lancaster, S.C., which is said by the owners to be the most modern bleachery in the world. Robert and Company, Inc., architects and engineers, wrote all specifications with an eye to reducing maintenance to a minimum. To forestall corrosion attack in condensate returns, vacuum priming system, and condenser water lines in the power plant, and in condensate returns, tempered water lines and cold water lines in the bleachery, Byers Wrought Iron pipe was installed. Condensate storage tanks, built while the project was still in its early stages, are also wrought iron. Tanks were fabricated by R. D. Cole Manufacturing Company.

Because almost every mill and factory contains many miles of pipe line, *proven* durability should be the first requirement in every installation. Byers Wrought Iron pipe has been successfully used in dozens of varied plant services, and its ability to serve longer, at lower cost-per-year, has been convincingly demonstrated.

The reasons for wrought iron's unusual service qualities are found in its unique composition and structure, which are duplicated in no other material. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack. The fibers also anchor the initial protective scale, which shields the underlying metal.

If you have any services in your present or projected plant where corrosion is a threat, you'll find it will pay to investigate wrought iron. Our bulletin, "Wrought Iron for Piping Systems", gives some helpful information. Ask for it.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N. Y.



CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Hose that breathes scalding steam

A typical example of B. F. Goodrich product improvement

THAT'S a pile driver at work, driving those logs into the river bottom for a new dock as easily as you'd drive a tomato stake in your garden. Steam—388° hot—provides the muscle. The steam flows through that special hose and pushes up the big iron weight. The steam is cut off, down comes the weight, the stake gets a pounding.

But steam that hot burned any hose carrying it. Weakened by the burn, the hose would suddenly burst—scalding, sometimes even killing workers.

B. F. Goodrich, with experience in making hundreds of kinds of hose, set out to stop this danger and waste. First they developed a rubber for the lining —a new kind of rubber that stands extreme heat without burning.

Then, instead of cotton cords to bind the rubber (cotton burned, too) BFG used fine, flexible, strong wire—one size has a quarter mile of it per foot of hose. Then more heat-resisting rubber, asbestos cord, and wear-resisting rubber for the outer cover.

The result is a hose B. F. Goodrich can call *Burstproof*. It has never been known to burst in service. On job after job it has lasted 4 and 5 *times* as long as any other hose ever used. It protects workmen, cuts replacement costs, keeps work flowing smoothly without shutdowns for repairs.

There is only one Burstproof steam hose made—B. F. Goodrich. For this safer, better hose call your B. F. Goodrich Distributor or write *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich
RUBBER FOR INDUSTRY

Howard Allen, *Inspector*

Howard Allen, *Lab. Man*

Howard Allen on *Order Desk*

Howard Allen, *Sales Representative*

Howard Allen, *Machine Operator*

Outside Man with an Inside Story

Do you know the inside story behind your Ryerson sales representative? It's a story of years spent within a Ryerson plant. A story of the steel inspection department, the operating department, the service department and others—inside jobs through which a Ryerson salesman builds up the experience he applies—outside—to your steel problems.

That's why you can be sure you're dealing with an experienced steel man when a Ryerson representative calls. He offers a complete steel service—carbon, alloy and stainless, sheared, sawed or slit, burned or bent, punched or threaded. And he can put to best use all the smoothly coordinated functions that make up this steel service, because he knows about them first hand.

Of course, he can't work miracles. Right now there simply isn't enough steel to meet current demand. But you can depend on your Ryerson salesman to cooperate closely and intelligently with you. From long experience he can often suggest practical alternates when the steel you need is not available. So, to make the most of available steel, talk it over with your Ryerson representative or phone our nearest plant.

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco.

RYERSON STEEL

FACTORY

MANAGEMENT and MAINTENANCE

MARCH, 1949

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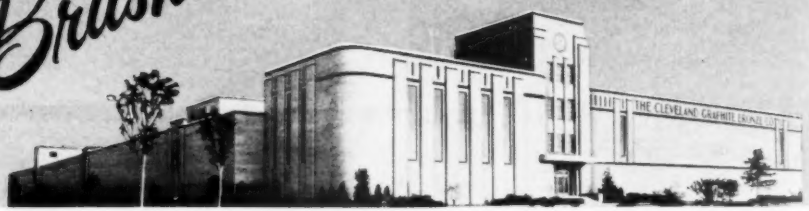
Osborn Brushes = FORMULA FOR KEEPING 16 ACRES* NEAT-AS-A-PIN!



Maintenance Crew of Cleveland Graphite Bronze Co. keeps *700,000 sq. ft. of plant area "Ship Shape" with longer lasting Osborn paint and floor sweeping brushes

THE Cleveland Graphite Bronze Co., Cleveland, Ohio, believes that plant cleanliness contributes to precise, efficient operation. And keeping "the world's largest producer of line bearings and bushings" neat and tidy provides a full-time job for 109 maintenance men.

To that end Osborn Brushes—longer lasting cleaning tools that cut maintenance costs—play a significant part. With 700,000 sq. ft. of floor space or *more than 16 acres* of cleaning area requiring daily attention, these lightweight "work-balanced" Osborn Brushes reduce fatigue, speed plant cleaning, save man hours. For maintenance costs are 99% labor and poor cleaning tools add to overhead by slowing down efficiency of cleaning personnel.

With today's high break-even point in plant operation, industrial America is alerted to the need for more effective time and labor saving tools. And *Osborn Power Driven Brushes, Paint Brushes and Maintenance Brushes* are serving cost-conscious companies by lowering production and maintenance costs.

For more "Brush Facts", get in touch with your local Osborn Industrial Supply distributor or write to...

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and increase profits!

G.P.&F.

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Simplify your production problems . . . reduce worries . . . add to profits . . . use the *overall* processing facilities of G. P. & F.'s "packaged service."

Before expanding your own production lines to make engine oil pans, fuel tanks, automotive and agricultural equipment parts, stainless steel stampings, machine safety guards, fabricated gear housings and other similar products, investigate Geuder, Paeschke & Frey's capacity for this work.

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G.P.&F.

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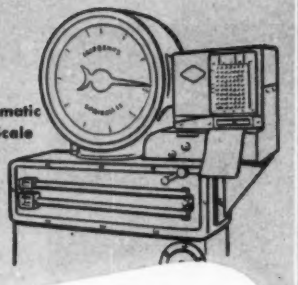
Bench Scale

Printomatic Dial Scale



Portable Dial Scale

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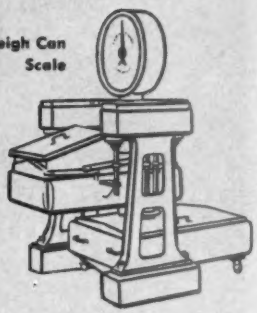
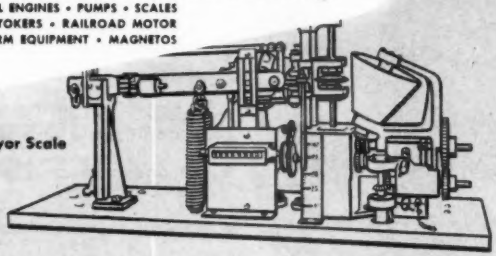
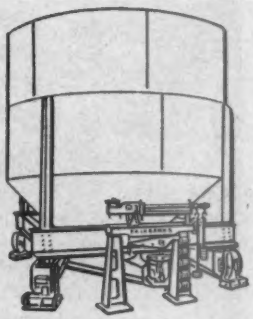
Weigh Can Scale

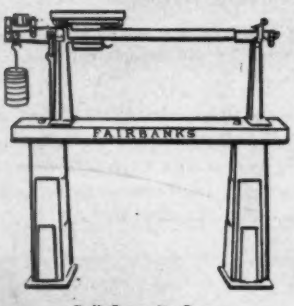


Belt Conveyor Scale

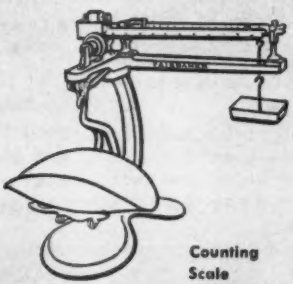




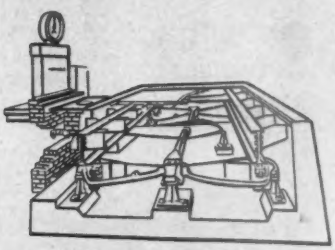
Hopper Scale



Full Capacity Beam

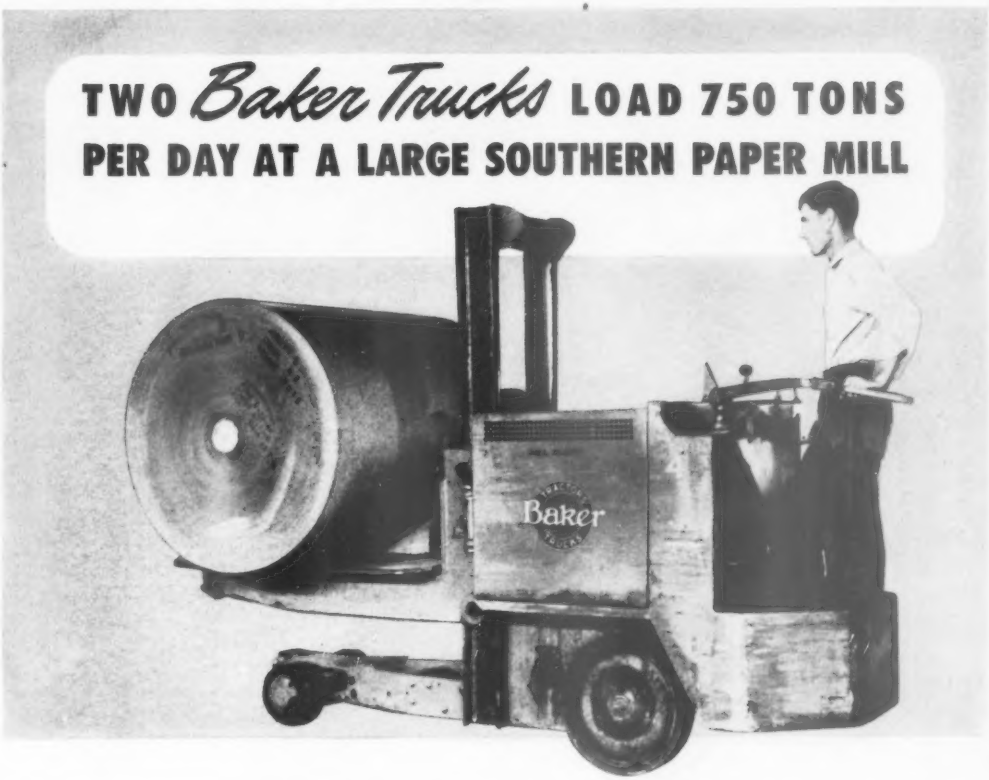


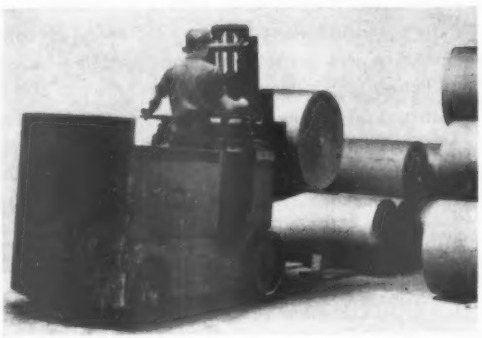
Counting Scale



Truck Scale

TWO *Baker Trucks* LOAD 750 TONS PER DAY AT A LARGE SOUTHERN PAPER MILL





Above—*Baker Hy-Lift Truck transporting a large roll of kraft paper.*

Below—*Baker Fork Truck tiering rolls of kraft paper in the warehouse.*

THIS MILL turns out 480 tons of liner board and 170 tons of kraft paper in a 24-hour day. Practically all of this is immediately loaded into cars with two Baker Hy-Lift trucks—operating round-the-clock—usually at high speed—service that is hard and gruelling.

The company also has a third Hy-Lift truck which is kept in reserve, and two Baker Fork Trucks which are used for warehousing rolls of paper and general supplies.

Despite their continuous, hard service, the trucks are giving top performance with a minimum of maintenance and down time—proving again that Baker Trucks are built to "take it"!

If you have a "tough" material handling problem, a Baker Material Handling Engineer will show you how to solve it with Baker Trucks.

BAKER INDUSTRIAL TRUCK DIVISION
of The Baker-Raulang Company
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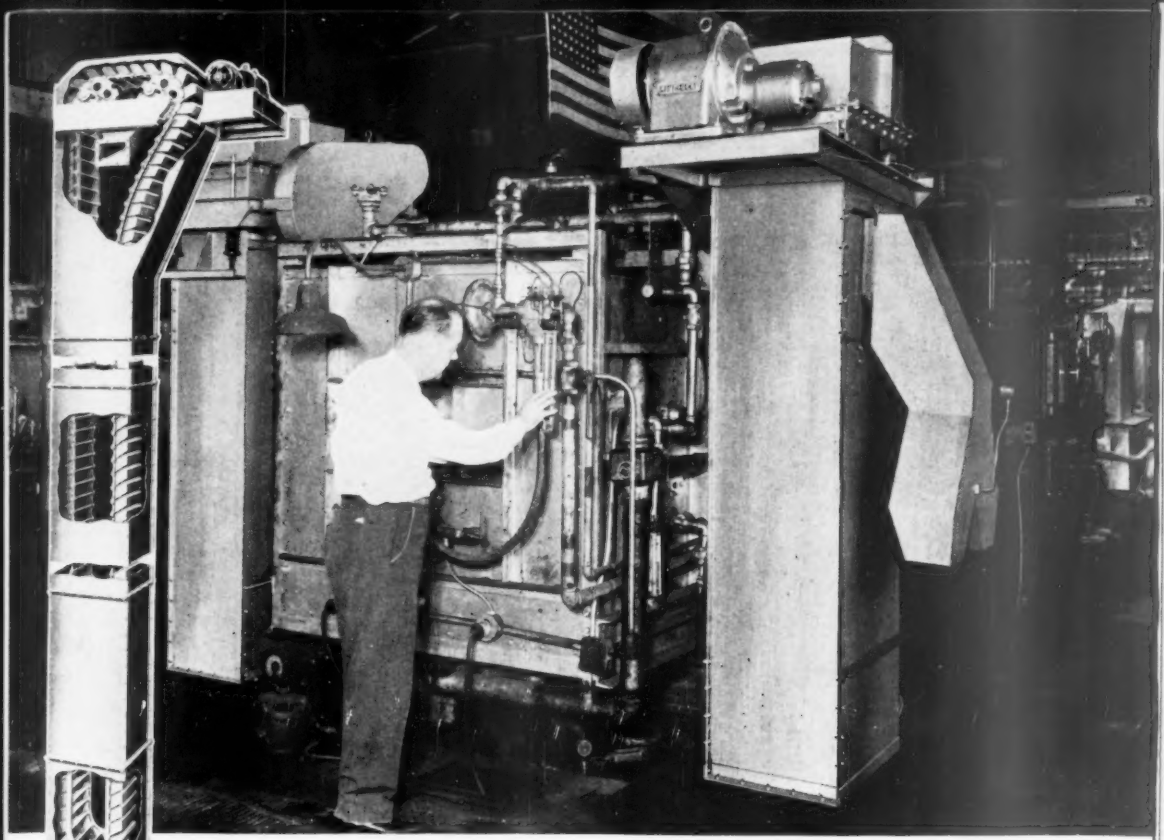
Baker INDUSTRIAL TRUCKS



LINK-BELT INTERNO

Bucket Elevator Handles Delicate Pieces *EXTRA GENTLY*

By turning a conventional bucket elevator inside-out, Link-Belt has developed a means of elevating relatively small pieces or parts which require gentle handling, and which cannot be handled safely by conventional elevating equipment.

Inwardly opening buckets load at an exceptionally low level, and discharge their contents with a gentle, pouring motion, in contrast to the throwing or dumping action of the usual bucket elevator. Loading and discharging spouts are on the broad side of the casing and either chutes or conveyors can be used to bring material to and from the elevator, giving wide flexibility in layout.

Illustrated above is an installation of two Interno Bucket Elevators lifting metallic pieces out of an oil quenching tank after heat treatment. Elevator buckets are perforated to permit oil to drain back into tank.

Cut-away view indicates double-head-shaft type for installations requiring increased elevator speed to gain greater handling capacity.

Folder No. 1983 gives full explanation and illustrates all details of the Interno Bucket Elevator. Write for a copy, and consult your nearest Link-Belt office for engineering suggestions on using Interno bucket elevators for mass handling of delicate materials or parts.

TYPES OF LINK-BELT CONVEYING MACHINERY

Belt Conveyors	Oscillating Conveyors
Screw Conveyors	Apron Conveyors
Bulk-Flo Conveyors	Flight Conveyors
Chain Conveyors	Bucket Elevators
Trolley Conveyors	Bucket Carriers

LINK-BELT COMPANY Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11,407

LINK-BELT

CONVEYING MACHINERY

"THE COMPLETE LINE"

Cuts Your Down Time

GETS YOU ROLLING AGAIN SOONER!

Example: Whether on Motors Under 200 hp, as Pictured, or as Big as the 2700 hp Motor that was Rewound and Running Again in Six Days for E. I. Dupont Co. — Service Stands Back of Charleston Electric Supply Co., Charleston, W. Va.

CHARLESTON ELECTRIC is a *typical* Allis-Chalmers Certified Service shop . . . the kind that is located in every major industrial center.

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A-C Certified Service Shops are hand picked from the best independent shops in industrial areas. Each meets exacting Allis-Chalmers standards for experience, highly skilled workmen, modern equipment and reputation for square dealing. Each uses nothing but factory approved methods and parts.

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PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

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FREE BOOKLET on Scientific Materials Handling.

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Because of their reliable performance, Elwell-Parkers have been making these economies for years—today the savings are *even greater* as compared to less efficient and less dependable methods. The Elwell-Parker Electric Company, 4323 St. Clair Avenue, Cleveland 3, Ohio.

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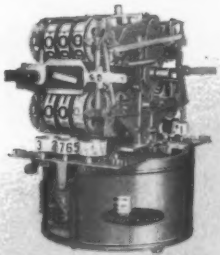
Established 1893

You Can COUNT on Veeder-Root



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New 1260 General-Purpose Counter, compact, streamlined, easy to build into any product.

New 1248 Reset Magnetic Counter for remote indication of machine production, from plant to office.

. . . at any point . . . in any business or industry

Typewriters, tractors, and textile looms . . . steel rolling mills, coin machines, and gasoline computer pumps . . . these and hundreds of other machines feature *built-in* Veeder-Root Counters which give their users up-to-the-minute *Facts in Figures* on operation, service, or production.

And these same *Facts in Figures* . . . delivered in terms of turns, strokes, pieces, trips, hours, volumes, lengths, light-flashes, hand-movements, or what have *you?* . . . are the bedrock basis of money-saving, vigilant Veeder-Root *Count*rol.

See that all new machines and equipment you buy are equipped to give you Veeder-Root *Count*rol. And see how *your own products* can build up sales by building-in a Veeder-Root Counting Device. Write.

New 1268 Non-Reset Magnetic Counter for coin machines.

Revolution-Hour Meter for tractors shows elapsed length of service and when overhaul time is coming due.

2-3 Pick Counter, for textile looms counts picks (shuttle-flights). Counter is convertible from 2 to 3 shifts.

Cut Meter for textile looms permits production of uniform lengths of cloth without "cut marks." Cut Meter knocks-off loom when predetermined length has been woven.

Direct-Reading Counter indicates thickness of steel sheets passing through rolling mill.

Veeder-Root COUNTERS

VEEDER-ROOT INC. Hartford 2, Conn.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3
In Great Britain: Veeder-Root Ltd., Kilspindie Rd., Dundee, Scotland

To everyone about to order unit heaters, Modine says,

"Look before you buy!"

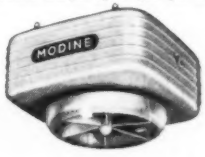
Design and Mechanical Patents Pending

MODINE MAKES THIS SPECIAL OFFER

Get the facts *RIGHT ON YOUR DESK.* Call your Modine Representative today to show you an actual Modine Unit Heater . . . to explain its features in detail. You'll like its attractive appearance, sound engineering, rugged construction. Examine Modine — compare it with other unit heaters before you make your decision.

Look at Modine Suspension!

See how this patented feature eliminates hanger-rods . . . speeds installation . . . lets you direct heat where you want it. Find out how it cuts installation charges up to $10 per heater.



Look at Modine Beauty!

Check Modine's clean, simple lines, beige-gray color, sparkling chrome trim. See how this attractive Modine appearance combines with quality Modine performance to give you the finest in unit heating today.

YES, look before you buy.. and you'll buy Modine!

It's easy to see the difference between Modine unit heaters and all other makes. One look will show you Modine is the leader — the only unit heater which gives you ALL these important features. Modern Beauty. All-Copper Coils. Peak Performance. Easy Installation. Smooth Operation. What's more, you can choose from 3 types and 47 capacities to meet your specific heat, air delivery, height and location needs.

When you look before you buy, you'll see why Modine leads the field. Call your Modine Representative for further details. He's listed in the "Where-to-Buy-It" section of your phone book. Or write direct. Modine Mfg. Co., 1512 Dekoven Avenue, Racine, Wis.

Send for the Modine Unit Heater Catalog Today!

Modine UNIT HEATERS

U-1002- r

NEW SIMOMETER

Here's how SIMONDS Quick and Easy Tensioning Method gives you LONGER BLADE LIFE!

Avoid Undertension which causes crooked cutting, spoiled work, lost time.

Avoid Overtension which causes blade-vibration, rapid dulling of teeth, frequent blade-breakage.

Slip the *Simometer* Directly over Blade, tighten two thumb-screws . . . now put tension on blade until **Simometer** needle moves into green zone . . . and you *can see at a glance* you have the right tension on the blade.

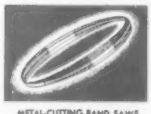
Then You're Set to get Faster, Straighter Cuts... and more cuts per blade... *the full measure* of performance which **SIMONDS** "Red End" Power Blades are made to give you. Ask your distributor.

BRANCH OFFICES - 1550 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 511 S. W. First Avenue, Portland 4, Ore.; 51 W. Trent Ave., Spokane 8, Washington. *Canadian Factory*- 595 St. Remi St., Montreal 30, Que.

SIMONDS ALSO MAKES:

FLAT GROUND STEEL STOCK (Oil Hardening)

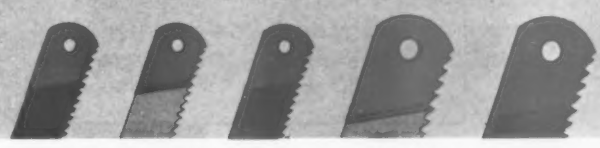
"RED TANG" FILES



METAL-CUTTING BAND SAWS (Regular Hard Edge, Skip-Tooth, Spring Temper)

CIRCULAR METAL-CUTTING SAWS (Inserted-Tooth, Segmental, Solid-Tooth)

SIMONDS "Red End" HACKSAW BLADES



WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

Do your motors operate under conditions of overload, heat, moisture? Are oil, dust, acids or corrosive vapors and fumes hazardous to motor operation in your plant? Interested in reducing motor failures—down time—rewind expense?

Then insist on Fiberglas*-base Electrical Insulating Materials on your next motor rewind. You'll find they have far higher resistance to these hazards than organic insulations . . . that they will save you time and money.

In or near your community, there are rewind experts skilled in the use of these highly efficient electrical insulating materials. Their shops are identified as Approved Fiberglas Repair and Rewind Shops . . . the motors they rewind are identified by the label shown above. Thousands of users all over the country are getting more dependable performance from motors bearing this sign—the sign of *performance plus*. Check the classified section in your phone book or write us for names of the shops in or near your community where you can obtain this service. Owens-Corning Fiberglas Corporation, Dept. 861, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

OWENS-CORNING
FIBERGLAS
ELECTRICAL
INSULATING
MATERIALS

*FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

YOU WON'T BELIEVE YOUR EYES

New Kind of *Featherweight* Skylift FORK TRUCK

HAULS and STACKS
where other trucks
DON'T DARE OPERATE!

WORKS ALL DAY FOR 22¢ *

Safe! Saves money in old buildings of light floor construction

IMAGINE a fork truck that operates on floors of extremely light construction . . . a truck so light in weight it operates safely in old buildings constructed only for manual handling.

IMAGINE a fork truck that maneuvers in cramped quarters and congested aisles . . . with a collapsed height of 78 inches, and a "free" lift of 68 inches before the telescopic mechanism is extended. So you can take a ¾ ton load through low doorways, into boxcars, even into many truck trailers. Yet it stacks your product 134 inches high from aisles narrower than 8 feet.

You won't believe your eyes when you see the amazing kind of hauling and stacking job this *new* FEATHERWEIGHT SKYLIFT FORK TRUCK does for you. And it does it in buildings where heretofore fork trucks could not be operated economically or safely.

It's a honey, too, in modern buildings, especially for dock operations or where loads are light, but bulky. Either way, it can save you thousands of dollars handling costs.

Motors, batteries and charging equipment are interchangeable with the famed standard Automatic Transporters. *You get a full 8 hours of work every day, year in and year out, for as little as *22c battery charging costs per day. Other operating costs are surprisingly low.*

In 1000- and 1500-pound capacities, with either solid or pneumatic tires, this lightest of all Skylift trucks has most of the outstanding features of its larger brother models. Let us tell you more about this wonder truck, and what it can save you in human energy and handling costs. Original low investment, makes it a natural to pay you big dividends. Mail coupon now!

Skylift
ELECTRIC TRUCKS
A PRODUCT OF AUTOMATIC
Lighten LIFE'S LOADS

CUTS HANDLING COSTS THOUSANDS OF DOLLARS

AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE YALE AND TOWNE MFG. CO.
39 WEST 87TH ST., DEPT. C-9
CHICAGO 20, ILL.

Please send me catalog and complete facts on new, low-priced FEATHERWEIGHT SKYLIFT FORK TRUCK.

Company Name.....
By.....Position.....
Street Address.....
City.....Zone.....State.....

STOP THE FIGHTING

between shafts and bearings!

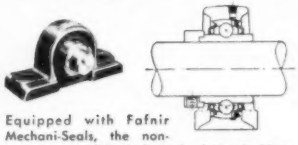
use FAFNIR PILLOW BLOCKS

equipped with the easy-on, easy-off Wide Inner Ring Bearing and the self-locking collar.

★ SINGLE PILLOW BLOCKS, self-aligning

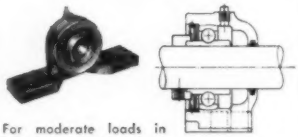
A compact design for fixed positions. Grease lubricated. Self-aligning . . . beveled outer ring and matching bevel on inside of housing.

LAK Type, Light Series



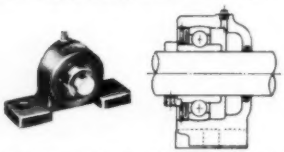
Equipped with Fafnir Mechani-Seals, the non-contact type labyrinth seal of interlocking steel plates. Traps in lubricant and locks out dirt and moisture.

SA Type, Standard Series



For moderate loads in proportion to shaft diameter. Pressed-steel labyrinth seals. Can be fitted with extra dust and dirt guards, front and rear, where extremely dirty conditions obtain. Side opposite collar can be closed.

SAO Type, Heavy Series

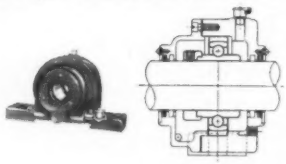


Uses a heavy series bearing to handle loads heavy in proportion to shaft diameter. Steel labyrinth seal. Special dust and dirt guards available when required by conditions. Side opposite collar can be closed.

★ SINGLE PILLOW BLOCKS, Floating Type

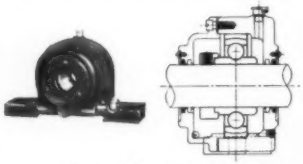
Where shaft temperatures exceed the normal, this oil lubricated design provides for shaft expansion by supplying pillow blocks in pairs, one fixed endwise, the other with a bearing free to float laterally. An additional self-aligning ring is incorporated in the bearing. Oil tight braided asbestos packing or a composition closure.

SAL Type, Standard Series



For normal shaft loads, light in proportion to shaft diameter.

SAOL Type, Heavy Series

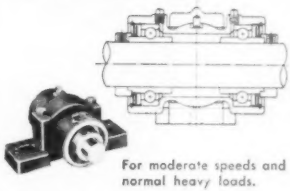


For loads heavier in proportion to shaft diameter.

★ DOUBLE PILLOW BLOCKS, with self-aligning feature

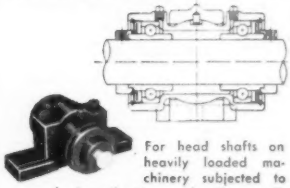
Alignment is provided in these double pillow blocks by means of a two-part base and top cap design which permits the bearing and housing to align freely on its pedestal. Compactness is gained by a low base-to-center distance. Designed for grease lubrication. As required by service, these blocks can be fitted with extra dust shields.

DSA Type, Standard Series,



For moderate speeds and normal heavy loads.

DSAO Type, Heavy Series



For head shafts on heavily loaded machinery subjected to shocks, vibration and other conditions of extremely heavy service.

Once "special", now standard

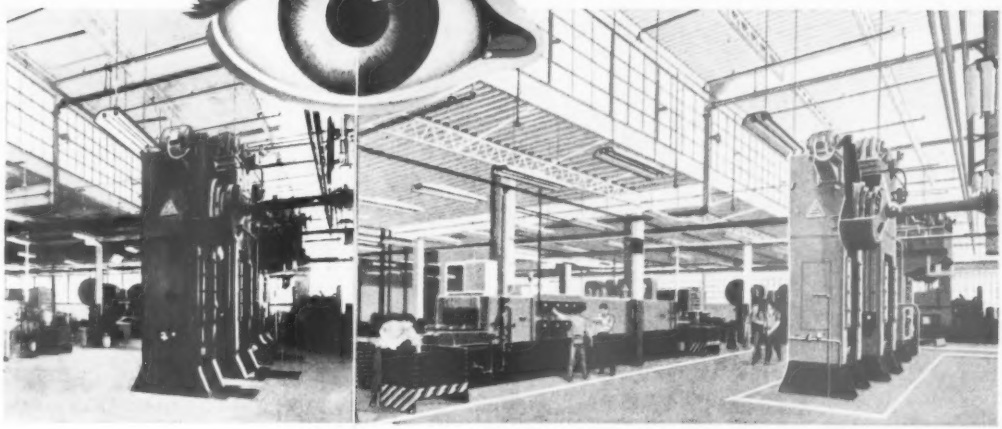
Each of these series of Fafnir Pillow Blocks was created to handle a troublesome transmission problem. Now these pillow blocks are standard, available out of stock to meet practically any condition. The same experience and ingenuity that developed this versatile line of pillow blocks backs up every Fafnir Distributor in working out a satisfactory solution to almost any power transmission problem facing you. The Fafnir Bearing Company, New Britain, Conn.

MOST COMPLETE LINE IN AMERICA

FAFNIR

BALL BEARINGS

WHAT'S YOUR PLANT'S EYE-Q?

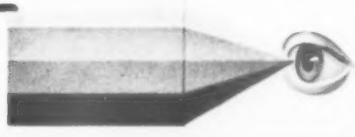


A High "Eye-Q" is the Cue to High Production

Typical of the interest of top-flight management in plant efficiency these days is the use of Truscon Cool Light Eye-Comfort Color Harmony system by the A. O. Smith Corporation in its vast new plant at Kankakee, Illinois. The Company's earlier experience with Truscon Eye-Comfort Color Harmony systems in sections of its Milwaukee, Wisconsin plant led to this decision. The new A. O. Smith Kankakee Plant is a marvel of modern industrial efficiency, featuring radiant heat. Forty miles of wrought iron piping and copper and steel tubing circulate hot water through the plant's 415,000 sq. ft. of floor space.

TIME-SAVING, money-saving, production-expanding advantages in your plant can hinge upon your decision with regard to painting. Proper plant maintenance demands that you paint to protect your plant investment. You can secure other equally valuable advantages by following Truscon's scientific Color Harmony systems designed to secure Eye-Comfort. Nature is restful to the eye and Truscon has developed four special color harmony series that are kind to the eye. Painting this modern way means a minimum of eye-fatigue, a minimum of attention distraction—and consequently a better production record and a better employee morale. It costs you nothing to get an Eye-Comfort Color Harmony recommendation for your plant. Address Dept. EC-4, *Truscon Laboratories, Division of Devoe & Raynolds Company, Inc., Detroit 11, Michigan.*

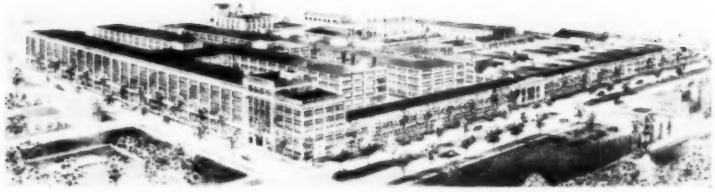
Eye-Comfort
COLOR HARMONY
DAY LIGHT • COOL LIGHT • WARM LIGHT • SOFT LIGHT



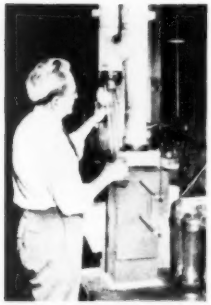
TRUSCON *Laboratories*

GROVER

PNEUMATIC TUBE SYSTEMS Save Time and Money In Many Modern Plants



BURROUGHS ADDING MACHINE COMPANY SPEEDS UP STOCKROOM TO ASSEMBLY LINE DELIVERY OF PARTS WITH GROVER SYSTEM



Special Grover Carrier as Well as Tube System Developed for Burroughs' Individual Needs

Ten minutes it used to take—by messenger! Four *seconds* it takes now by Grover Pneumatic Tube! Think of it—a hundred and fiftieth of the previous time. But Burroughs, making assemblies of as many as three different types of product on a single assembly line for one day, wasn't content to take those ten-minute time lags and do nothing about it. Burroughs men plus Grover men decisively licked this problem. Final assembly, sub-assembly and stockroom are now Grover-linked at Burroughs. Requisitions flash one way—parts flash back in quick response in specially developed carriers. Time is saved, the potential of human error in such transactions is now practically nil. Have *you* a special problem? Grover representatives are at your service, no charge, no obligation. May we send you a copy of our latest Factory Bulletin?

GROVER has a special Factory Bulletin of interest to plant traffic and production personnel. Write Grover Company, 25519 W. Eight Mile Road, Detroit 19, Michigan.

GROVER

PNEUMATIC TUBE SYSTEMS LITERALLY GIVE WINGS TO PAPER WORK, MONEY, SMALL PARTS, SAMPLES

Man or boy messenger service is not adequate to fit in with the tempo of present day industrial production. Uncertainty, human error, slowness—these factors can all be ruled out by planning on GROVER equipment to do the messenger job quickly, tirelessly, without error.

ELIMINATES ERRORS, DELAYS, HIGH COST OF MESSENGER SERVICE

Central control by trained personnel is a major factor in the stepped-up plant efficiency secured with a GROVER installation. Quietly and speedily inter-departmental communication and transmittal go on. In chemical sampling analysis, in production line delivery of small parts, in all paper work transmission, there's a degree of efficiency achieved that management needs.

GROVER

• PNEUMATIC TUBE SYSTEMS •

THE GROVER COMPANY • DETROIT 19, MICHIGAN

Offices in Principal Cities

OUTDOOR FURNITURE MAKERS *Can Relax and Rest Easy*

...when their costs are fastened down ... and sales speeded up... by AMERICAN PHILLIPS SCREWS

VACATION FROM COST-WORRY: Assembly costs are controlled ... *fixed and held as much as 50% lower than you ever saw them before* ... when old-fashioned slotted screws are replaced by modern, power-driven American Phillips Screws, the *only* screws with the crossed, *cornerless* recess. Production and product-quality go up as worker-fatigue goes down. And profits flourish as rejects and spoilage all but vanish.

VACATION FROM SALES-WORRY: Customers *don't* like bungled fastenings with ugly, marred surfaces and broken screw-heads that snag clothes. And that's exactly why they *do* like American Phillips-fastened products ... because every fastening is cleanly made and attractive to look at, with never a burred head to spoil sales-appeal. So fasten *your* product with American Phillips Screws... *and help yourself to double profits.*

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: **589 E. Illinois St.** *Detroit 2:* **502 Stephenson Building**

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Runs 'em Up... HAMMERS 'em TIGHT!

HAMMERS 'em LOOSE... Runs 'em OFF!

Powerful
NEW Van Dorn
3/8" Electric
Impact Wrench
$105.00
Speeds Up Running and Removing NUTS, BOLTS, CAP and LAG SCREWS, up to 3/8" thread size!

1. **POWERFUL!** Delivers 2000 blows per minute to hammer fasteners loose or drive them home—*in a few seconds*. (Free running speed: 1600 R.P.M.)

2. **LIGHTWEIGHT!** Weighs only 8¼ lbs.—yet has *driving capacity* of conventional nut runner weighing *almost 30 lbs.!*

3. **EASY TO CONTROL!** Operator can control this perfectly-balanced Wrench by holding it lightly, with one hand! Toggle reversing switch positioned for fast thumb operation.

4. **CUTS OPERATOR FATIGUE!** No jarring, twisting or fighting the Wrench because torque *is not transmitted* to operator.

5. **NO STALLING!** Famous full-powered Van Dorn-built motor *can't* be stalled—even when spindle is stopped dead—no danger of overload or burn-out.

For a real eye-opener in performance, ask your nearby Van Dorn Distributor for a free demonstration of this great, new Electric Impact Wrench. Learn how it can cut your costs, speed up your work, save your workers from excessive, wasteful fatigue! Write for free illustrated catalog to: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson 4, Maryland.

FOR POWER SPECIFY

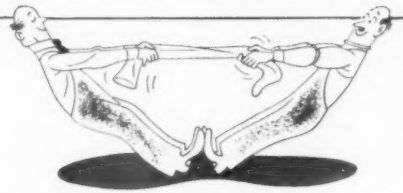
"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

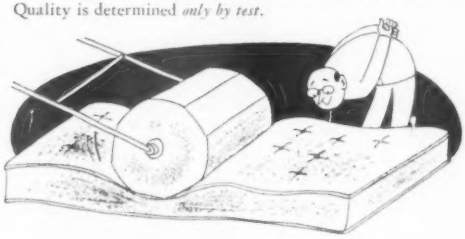
These are "Trying" Times

—be sure to try it before you buy it!



The Pull-the-Leg Test. You should see what a woman's stocking goes through before it reaches a leg. Wow! Snagging tests, abrasion tests, flexing tests, bursting tests, dye and fiber tests. But after all, it makes sense. Quality is determined *only by test.*

The Lye Test. Don't let anyone "pull the wool" over your eyes. If you want to make sure a fabric is all wool, simply boil a small piece of it for about fifteen minutes in a solution of lye and water. If the fabric dissolves completely . . . well, it *was* all wool.



The Sleep-Like-a-Log Test. They use a mechanical Rip Van Winkle to test the quality of a mattress. Back and forth, back and forth a heavy eight-sided roller passes over the mattress. If the mattress can stand up under 400,000 passes, you can be sure it's one of the best.

The Square Foot Test

One of the surest tests to find the best *and most economical* brand of paint to use in your plant is the *square foot test.* Take a gallon of any good paint and a gallon of Barreled Sunlight. Thin each according to directions on the cans. Then measure the number of square feet each paint covers on a wall. And, because labor represents about 80% of the cost of any painting job, check the length of time it takes to apply each paint. Notice the difference in their whiteness and hiding power after drying overnight.

Yes, compare any good paint with Barreled Sunlight. You'll see that *Barreled Sunlight will do a better-looking, longer-lasting job at lower cost for both paint AND LABOR than any other paint on the market.*

See for yourself. Let your nearest Barreled Sunlight representative give you a convincing demonstration. Write.

U. S. GUTTA PERCHA PAINT COMPANY
2-C Dudley St., Providence, R. I.

Barreled Sunlight *Paints*

In whitest white or clean, clear, pleasing colors, there's a Barreled Sunlight Paint for every job

REPLACE WITH G-E RECTIFIER TUBES

—for fast local service on deliveries

—for dependable performance when installed

THESE important tubes that convert your a-c power supply (changing it to the d-c required by high-frequency heaters and other equipment) are a *must-have-fast* replacement item. You can't wait for new tubes when you need them, unless willing to face losses in plant output due to idle production machines.

General Electric is your preferred supply source! Near you is a G-E distributor or dealer with rectifier and other tubes in stock. Word from you that you need tubes, is all he requires to make immediate delivery to your door. His tubes are fully covered by G-E warranty; you can install them with assurance you've bought the best. And he has the right tubes for your sockets. In gas or mercury-vapor-filled rectifier tubes (phanotrons) alone, G. E. offers no less than 15 types ranging in capacity from .25 to 75 amperes average current.

Phone your G-E tube distributor or dealer today! If you haven't his name or address, or if these aren't readily at hand in the classified or general sections of your phone directory, ask your G-E electronics office to refer you to the distributor or dealer nearest you. Or write direct to *Electronics Department, General Electric Company, Schenectady 5, New York.*

Type	Cathode voltage	Cathode current	Anode peak voltage	Anode peak current	Anode avg current
GL-866-A	2.5 v	5 amp	10,000 v	1 amp	0.25 amp
GL-8008	5 v	7.5 amp	10,000 v	5 amp	1.25 amp
GL-673	5 v	10 amp	15,000 v	6 amp	1.5 amp
GL-869-B	5 v	18 amp	20,000 v (*15,000 v)	10 amp (*15 amp)	2.5 amp (*5 amp)
GL-857-B	5 v	30 amp	22,000 v	20 amp (*40 amp)	5 amp (*10 amp)

(*Quadrature operation)

G-E ELECTRONICS OFFICES ARE LOCATED IN THE FOLLOWING CITIES:

ATLANTA 3, GEORGIA
187 Spring Street, N. W.
Phone: Walnut 9767

BOSTON 1, MASSACHUSETTS
140 Federal Street
Phone: Hubbard 1800

CHICAGO 54, ILLINOIS
Merchandise Mart
Phone: Whitehall 3915

CINCINNATI 2, OHIO
215 West Third Street
Phone: Parkway 3431

CLEVELAND 14, OHIO
710 Williamson Building
Euclid Ave. and Public Square
Phone: Superior 6822

DALLAS 2, TEXAS
Norman Bldg., Ross & Lamar Sts.
Phone: Riverside 9121

DENVER 2, COLORADO
650 Seventeenth Street
Phone: Keystone 7171

KANSAS CITY 6, MISSOURI
106 West 14th Street
Phone: Victor 9745

LOS ANGELES 14, CALIFORNIA
Suite 1300-1301
Security Title Ins. Bldg.
530 West 6th Street
Phone: Madison 7381

NEW YORK 22, NEW YORK
570 Lexington Avenue
Phone: Plaza 5-1311

PHILADELPHIA 2, PENNSYLVANIA
1405 Locust Street
Phone: Pennypacker 9000

SALT LAKE CITY 9, UTAH
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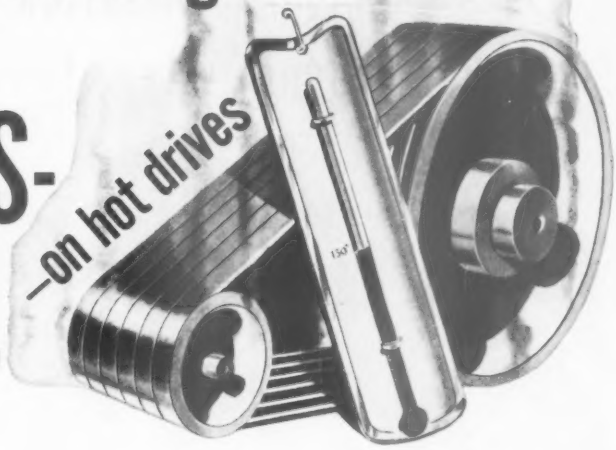
You can put your confidence in—

GENERAL ELECTRIC

180-HA27-8850

2 to 4 times longer belt life with COMPASS-V-STEEL —on hot drives



A LARGE New England paper mill had constant trouble V-belting their blowers. Due to the difficult operating conditions, the wide temperature ranges, conventional cord belts lasted at most six weeks.

Then the G.T.M.—Goodyear Technical Man—recommended Goodyear COMPASS-V-STEEL Belts. That ended the belt trouble. Today these steel cable belts have entirely replaced the cord variety. And, depending on temperature conditions, their average life is 3 to 6 months—*2 to 4 times longer.*

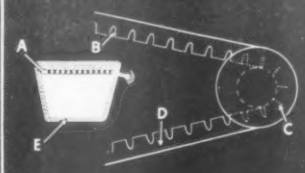
The superior performance of COMPASS-V-STEEL Belts is due to their revolutionary construction. They are sinewed with wiry, super-strong steel cables that safely carry far heavier loads than any previous belt. Heavy drives can be operated with fewer belts without loss of efficiency.

The G.T.M. will be glad to give you the full story on these miraculous new belts; how their economies can be applied to your operations. Just write: Goodyear, V-Belt Sales Dept., Akron 16, Ohio or Los Angeles 54, California.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GTM -Specified COMPASS-V-STEEL BELT

for all types of V-drives



- **A** Load-carrying section of endless high-tensile steel cable.
- **B** Vents open between pulleys, dissipating heat.
- **C** Vents compress rounding pulleys, giving continuous gripping surface.
- **D** Highest quality rubber underbody.
- **E** Sturdy, bias-laid fabric cover resists wear.

FOR HOSE, BELTING, MOLDED GOODS, PACKING AND TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

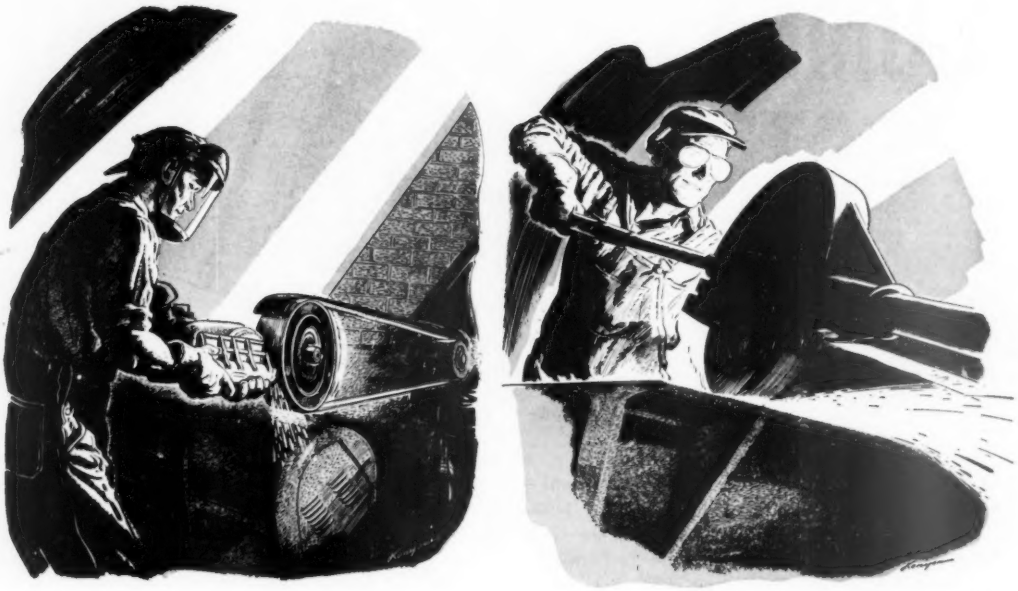
Compass—T.M. The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

A note on Abrasives

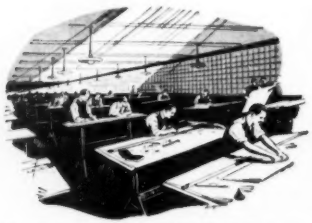
Better utilization is leading to higher productivity...lower cost



New developments in abrasive uses are being introduced continually. They are offering new production efficiencies and often provide the solution to difficult and complicated problems.

The degree to which these benefits and improvements are realized depends upon obtaining the full value offered by these products. It means utilizing them to best advantage. The best product available will not deliver top performance under unsuitable conditions. A slight change in grit or splice—or in grade, shape, or speed can often reduce a cost or improve a finish. That is why it is so important to "fit" the abrasive products you use to the job. In the experience of many abrasive users, it is a time and money-saving must.

If you would like to know whether you can use a better abrasive product or get more production or economy from the abrasive tools you are now using, it's a simple matter to call in CARBORUNDUM. We invite you to get acquainted with our service where similar problems are being worked out every day. Abrasive engineering, technical cooperative assistance, and the vast facilities and experience of the leading name in abrasives are always ready to serve you. The Carborundum Company, Niagara Falls, N. Y.



The only complete line of Abrasive Tools is

CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

Engineering News
ON ABRASIVE PRODUCTS

Greater Efficiency from New Coated Abrasives

A much higher degree of efficiency is being realized in dry grinding operations on metals. It is credited to the development of a new Resin Industrial Cloth specially designed for use on backstand idlers. This product is particularly effective on operations involving heavy stock removal, sharp contours, high belt speeds, heat sensitive metals, excessive frictional heat, humidity and other complications.

Strength, heat-resistance and backing characteristics provide longer productive life where severe strains are imposed. A remarkable freedom from gumming and loading, together with resistance to grain shedding, produce fine finishes, results in infrequent belt changes. This means stepped up production . . . longer runs.

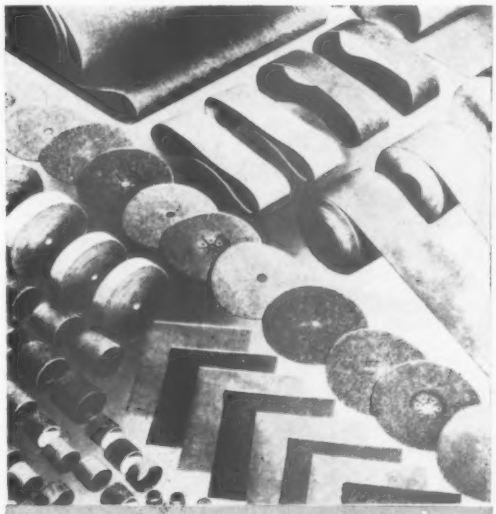
To attain the greatest productivity at low cost from Resin Industrial Cloth, attention must be closely centered on its correct selection and utilization. Our field men are fully informed and experienced. It is only logical to ask their advice on your particular application. They will be glad to cooperate.

New Development in High Speed Snagging Wheels

B-5 and B-7N are a recent development in ALOXITE aluminum oxide resinoid bond wheels that represent a major advance in high speed snagging. Actual operating experience in foundry, mill, forge and welding shop operations confirms a long list of advantages. A cutting rate as high as 9500 surface feet per minute is maintained continuously throughout the extended life of these wheels; primarily because the tendency to load is much less than with previous wheels of this type. A maximum degree of safety is provided the operator under severe conditions. Speed tests to destruction reveal a much higher mechanical strength while field tests show greatly improved resistance to heat and mechanical shock.

On the less severe applications, the relatively softer bond B-5 provides faster cutting and delivers greater efficiency. The tougher B-7N is more efficient on severe operations and lasts longer. As further proof that this strength and toughness do not detract from grinding efficiency, more than a few operating reports show savings up to 50% realized where correct selection and application has been made. The experience and knowledge that fostered the development of these wheels is available, through our men in the field, in selecting the correct grit and grade to produce such results.

For prompt attention to abrasive problems, call your nearest branch office of The Carborundum Company.



COATED PRODUCTS — SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS — ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS

FOR EVERY ABRASIVE APPLICATION
. . . CALL IN
CARBORUNDUM
TRADE MARK

up to 1/3 less space...
improved windings...
plate steel protected...
WESTINGHOUSE
NOW...
LUBRICATED for LIFE

YOU CAN BE SURE.. IF IT'S
Westinghouse

—and NOW...

Lubricated for LIFE!

Now . . . for the first time . . . you can install electric motors, or motor-driven machines . . . and forget motor lubrication *for life!*

Westinghouse Life-Line . . . industry's amazing new, all-steel motor . . . now completely eliminates the biggest element in the maintenance of motors and motor-driven equipment . . . the need for periodic motor lubrication.

Eliminated, too, are two of the most frequent causes of motor burnouts and lost time . . . overgreasing and undergreasing of motors. Life-Line motors are equipped with sealed bearings, pre-lubricated for life with a more-than-ample supply of specially-treated lubricant.

Correct lubrication and long life are assured . . . machine outages are reduced . . . motor drive problems are simplified, since motors can be located without need for constant accessibility.

Added to Life-Line's outstanding advantages of plate-steel protection, improved windings and more compact size, *lifetime lubrication* is one more important reason for starting to convert, today, to Life-Line power. Standard ratings are available from stock—others on short delivery schedules. Ask your Westinghouse representative for price and delivery on your requirements, or write P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21495

Westinghouse
Life-Line
Motors

NOW...
DRIVE PROVED
MADE WITH RAYTEX FORTIFIED RAYON
Strong, continuous filament rayon specially processed to eliminate stretch...Impregnated with live rubber for high flex strength and long life.
MINIMUM STRETCH • GREATER FLEX STRENGTH • LONGER V-BELT LIFE

Only Dayton V-Belts are DRIVE PROVED for the Job

HEAVY-DUTY DRIVES

The Dayton Thorobred, standard of industry. Bends without straining or heating. Always runs true, flexes freely around the pulley without squashing. Equally efficient on V-Flat drives. Matched in sets for multiple drives.

LIGHT-DUTY DRIVES

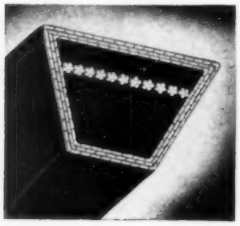
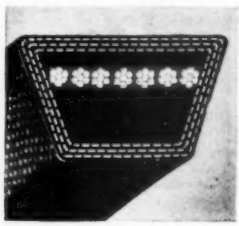
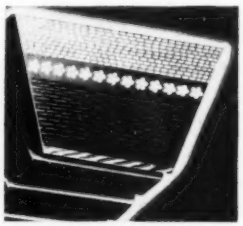
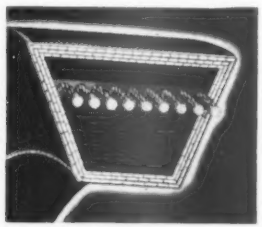
The Dayton FHP V-Belt, for fractional horsepower motors on small machines and appliances. Especially designed for quiet, vibrationless performance. Exceptionally strong. Will not twist, squash, or stretch.

SMALLER PULLEY DIAMETERS

The Dayton Cog-Belt, the most flexible V-Belt made. Permits use of 25% smaller pulley diameters and shortest centers for greater saving of space. The built-in Cogs eliminate bumping, jarring or inching.

HIGH-SPEED DRIVES

Dayton Steel Cable V-Belts for extreme load conditions. Fine gauge, heat-treated steel strands, cabled for extra strength. Evenly spaced and absolutely parallel. Available in patented Cog, or standard V design.

Dayton V-Belts

..as near as your telephone

A new V-Belt service by Dayton, to save you time and money three ways:

1. "Drive Proved" V-Belts

To give you the right belt... drive proved to your particular drive. For Dayton has made more than 100 million V-Belts. They have been drive proved in every kind of industry, under every possible operating condition of heat, cold, dirt, dust and oil. They have proved their ability to save space; to provide positive power; start and stop smoother; run quietly, without vibration and last longer than any ordinary belt.

2. As near as your telephone

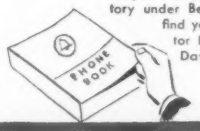
There is a Dayton V-Belt Distributor near you. He is equipped with the specialized knowledge to recommend the right drive to serve you most efficiently. If it's an unusual application, he has the resources of the entire Dayton organization to call on. You'll find him listed in the classified section of your telephone directory or his representative is now calling at your plant.

3. Instant maintenance service

Your Dayton Distributor maintains complete stocks of Dayton "Drive Proved" V-Belts and Pulleys. He is prepared to give you instant service for existing or future drives, and to provide you with an immediate source of mill supplies.

Put this new service to work in your plant now. Equip your drives with Dayton "Drive Proved" V-Belts and be sure you are getting the maximum in drive performance and service. Call your Dayton V-Belt Distributor today. *The Dayton Rubber Company, Dayton, Ohio.*

IT'S EASY TO BUY DRIVE PROVED **DAYTON V-BELTS**



Look in the yellow pages of your telephone directory under Belting. You'll find your distributor listed under Dayton V-Belts.

Phone him. He has the specialized knowledge to recommend the right "Drive Proved" Dayton V-Belt for your particular drive.

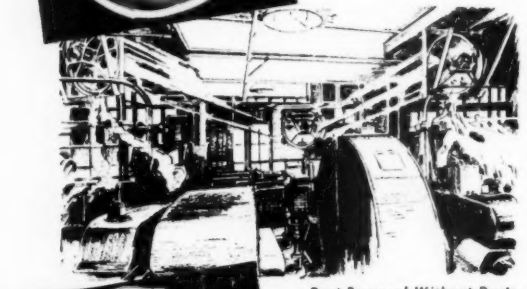
He maintains complete stocks of Dayton V-Belts and Pulleys for your needs. Assures you that your drives will always perform with top efficiency.

Dayton Rubber

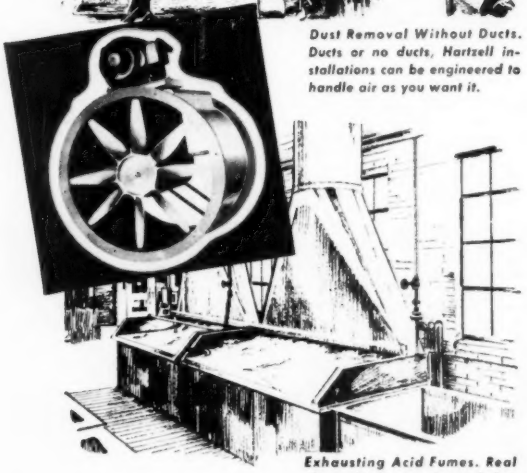
HARTZELL FANS

will solve your HEAT-DUST-FUME problems . . .

Foundry Pouring-Floor Ventilation. No more steaming heat, acrid fumes or grimy air when Hartzell does the job.



Dust Removal Without Ducts. Ducts or no ducts, Hartzell installations can be engineered to handle air as you want it.



Exhausting Acid Fumes. Real air-moving power is needed to pull fumes away from the faces of workers. Hartzell does it.

Look to the air in your plant if you want to know the reason for bad production spots — high man-hour costs, careless workmanship, high accident rate, low employee morale.

It isn't always the man or the machine. It's often the air. If it feels hot it's costing you money. Or cold. If you can see it, it's dirty. If it tickles your nose it's fume-laden. If you feel it move it's drafty. If it is oppressive, "heavy," it's too humid. Air like that is overhead cost — deadwood — profit-stealer — bad business!

Hartzell fans, plus Hartzell field-and-factory engineering, have been whipping situations like those for more than twenty years. Hartzell is an ***industrial*** fan-and-blower specialist. One whose field and factory men know industrial air-movement problems because they've gone into the plants and come up with the answers. One whose products will make air turn hand-springs for you against any pressure, as high as 8" water gauge. And one who has an engineering office near you to make sure you get the ***results***, not just the fan or the blower.

Industrial people like Hartzell fans and blowers because they are built ***for industrial use***. Low installation cost; low operating cost; low maintenance; minimum attention; long life.

Get good air. If you don't know your nearby Hartzell representative, write us for his name.

HARTZELL
PROPELLER FAN COMPANY
PIQUA, *DIV OF CASTLE HILLS CORP.* OHIO

●

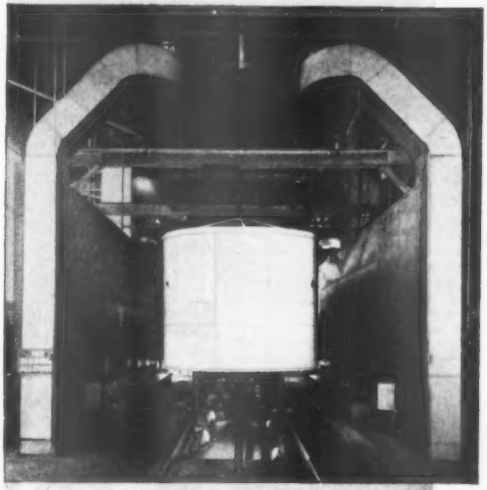
Member of **PROPELLER FAN MANUFACTURERS' ASSOCIATION**

PROPELLER-TYPE FANS AND BLOWERS • ROOF VENTILATORS • UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT

Finish Coat Hydro-Filter Spray Booths and Baking Ovens on Two Finishing Production Lines 1750 Ft. Long—Part of a Complete Mahon Finishing System in Fruehauf's New Plant, Avon Lake, Ohio.



Fruehauf Truck Trailers Passing Through Mahon Hydro-Filter Chassis Spray Booth on One of the Production Lines at the Avon Lake Plant

. . . Better Finish at LOWER COST with Modern Finishing Equipment!

In any industrial plant where finishing constitutes a major operation, a modern, well planned Finishing System is essential to low-cost production . . . the equipment must be properly planned, and properly engineered and co-ordinated with the general production scheme, in order to achieve minimum finishing cost per unit processed in every day operation. That is why initial capital outlay for equipment of this type is a secondary consideration . . . that is why you should take advantage of the broadest experience available when contemplating new Finishing Equipment for your plant. The Mahon organization offers you the benefit of their experience in pioneering development in this highly specialized field through the past twenty-eight years . . . an accumulated wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File for complete information, or arrange consultation.

THE R. C. MAHON COMPANY

Home Office and Plant, Detroit 11, Mich. • Western Sales Div., Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Chemical Preparation Equipment, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply System, Drying and Baking Ovens, and Paint Reclamation System. Also, Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

MAHON

EXIDE-IRONCLAD BATTERIES

are DIFFERENT!

Specially designed to provide dependable power for ELECTRIC INDUSTRIAL TRUCKS

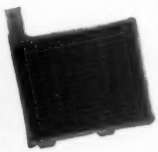
Storage batteries are called upon to perform many tasks. No single type of battery is adequately suited for all. Exide engineers have developed batteries designed to fit each power requirement. They differ in a number of ways, but chiefly in the positive plates around which the other elements are built. In the Exide line there are three basic types of positive plates. The Exide-Ironclad was developed to meet the need for a heavy-duty battery with great reserve power and the ability to discharge at high rates, at high voltage and over a long period of time.

Exide-Ironclad Batteries are DIFFERENT . . . different in design . . . different in construction . . . different in service qualities. Chief among these differences is the unique positive plate, an exclusive Exide feature, which provides advantages not possessed by any other type of plate used in batteries for motive power service. See opposite page for detailed description.

DESIGNED FOR STATIONARY USE

The manchester type of positive plate has the unique lead button construction . . . rolled strips of corrugated lead, pressed into holes of lead antimony grid. It is widely used by electric utilities, telephone and telegraph companies, radio and television stations . . . and for railway signal systems, emergency lighting and other stationary applications.

DESIGNED FOR AUTOMOBILE USE



The Exide flat positive plate is of staggered grid construction, pasted with active material which years of experience has proved most efficient and durable for the services for which it was designed. Used for starting, lighting, ignition and other services in cars, trucks, buses, aircraft and general storage battery tasks.

DESIGNED FOR MOTIVE POWER

The Exide-Ironclad positive plate, of slotted tube construction, was developed by Exide Engineers to provide a battery of extra power, sturdiness and durability to meet the exacting needs of motive power equipment. Exide-Ironclad Batteries are noted for high capacity and ability to deliver adequate power throughout each shift. Fully described on opposite page.

1888

DEPENDABLE BATTERIES FOR 61 YEARS

1949

Many Outstanding Features

VENT PLUG
Specially designed to prevent escape of electrolyte.

GREASE SEAL RING NUT
Holds battery elements securely in place . . . prevents creepage of electrolyte . . . keeps tops clean and dry.

SEALED CELL COVER
Flush with top of jar. Prevents collection of dirt or moisture . . . keeps impurities out of cell . . . eliminates leakage of electrolyte.

SEPARATOR
Of high porosity, specially treated to last the life of the battery.

NEGATIVE PLATE
Made extra heavy and built to match the long life of the positive plate.

JAR
Made of specially tough and durable Giant Compound. Built to withstand the jolts and jars of hard industrial usage. Practically unbreakable in normal service.

FEET
Internal short circuits practically eliminated by having the two feet on negative plate rest on different ribs from those of the positive plate, and by having separators extend below both plates and rest on all four ribs.

RIBS
Support all plates and separators. Their height provides generous sediment space, so that internal cleaning is unnecessary.

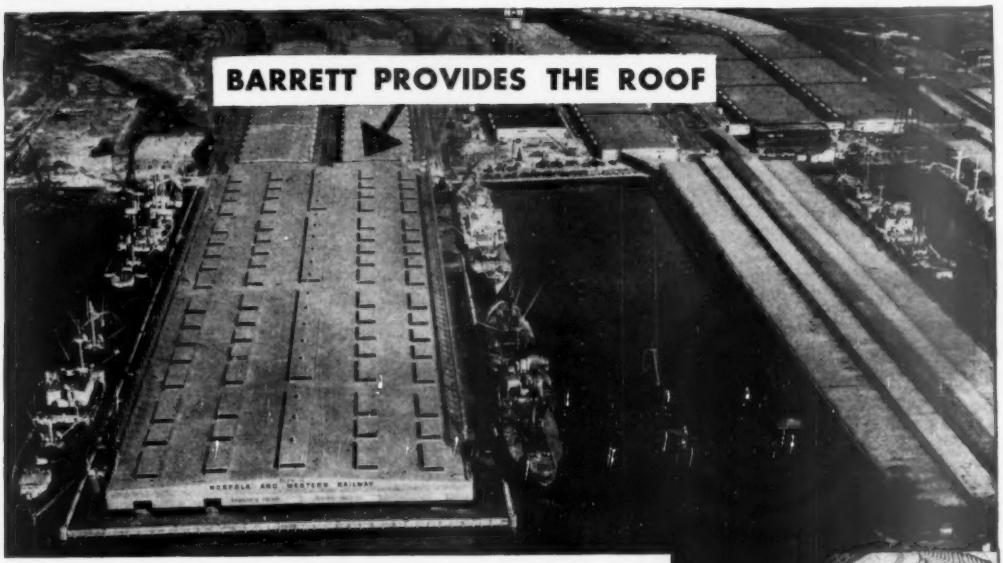
DEPENDABLE POWER

Exide-Ironclad Batteries have ALL FOUR of the characteristics that a storage battery must have to assure maximum performance from battery electric industrial trucks—high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of dependable day-in, day-out service with economy.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Exide-Ironclad"
Reg. Trade-marks U.S. Pat. Off.

NEW NORFOLK, VA. PIER IS ONE OF WORLD'S LARGEST



Measuring 1,100 feet from end to end, Norfolk's new super-pier can berth four large merchant ships at once. Its vast storage shed covers nearly eight acres. A Barrett* roof was the natural choice—not only because it defies all weather, but also because it has the ability to withstand wind-sway and the shock of ship landings. The Barrett Specification* roof is the toughest, longest-wearing, best-value built-up roof that money can buy.

1 Barrett Specification* roofs are applied by Barrett Approved Roofers according to rigid Barrett specifications developed through years of successful roofing experience.

2 They are built up of alternate layers of finest grade coal-tar pitch and felt. Barrett* pitch, the *life-blood* of the roof, is impervious to water and unexcelled as a waterproofing agent.

3 Top quality felt of Barrett's own manufacture holds the pitch in place and permits the use of greater quantities of this waterproofing than would otherwise be possible.

4 Final steps are a triple-thick coating of pitch—*poured*, not mopped—plus an armored surface of gravel or slag. Result is a roof that takes Fire Underwriters' Class "A" rating—a roof so good it can be bonded for 20 years.

SEE BARRETT'S CATALOG IN "SWEET'S," OR SEND FOR "REFERENCE MANUAL FOR ARCHITECTS AND ENGINEERS"

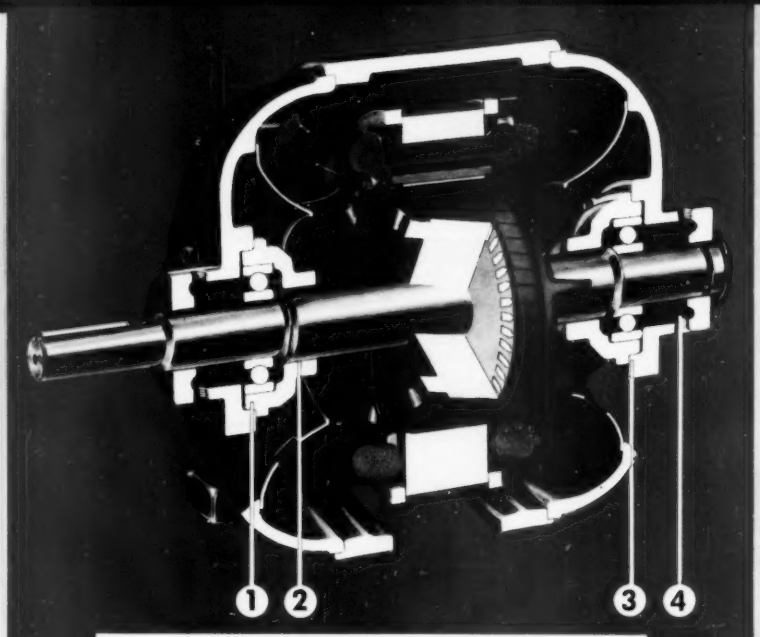
THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

36th St. & Gray's Ferry Ave., Philadelphia 46, Pa.
2800 So. Sacramento Ave., Chicago 23, Ill.
1327 Erie Street, Birmingham 8, Ala.
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

Barrett Specification Roofs*

*Trade-mark Reg. U. S. Pat. Off.

YOU CAN'T BEAT A
TRI CLAD MOTOR FOR
EASY MAINTENANCE
GENERAL ELECTRIC
HERE'S
WHY



Notice (1) how Tri-Clad bearings are surrounded by and rigidly supported in solid cast-iron housings. Compare the long, close-running fit between housing and shaft (2) with other motor bearings. Examine the tight rabbet fit between inner cap and end shield (3) which keeps dust and moisture out and lubricant in. See, too, the pressure-relief greasing system (4) that makes it easy to lubricate if you need to.

You can't beat a TRI CLAD motor for easy maintenance

A TRI-CLAD MOTOR will run safely without lubrication for years—for as long as any other general-purpose motor you can buy. The big thing is—it's *grease-gun easy* to lubricate a Tri-Clad if you need to.

You don't have to take a Tri-Clad motor down and disassemble the bearings to lubricate it. You don't have to follow special instructions. A standard gun and a good grease are all you need.

And remember, Tri-Clad gives you all the extra protection that only cast-iron structure can give . . . Extra protection against rust and corrosion . . . Extra protection against mechanical abuse and permanent distortion . . .

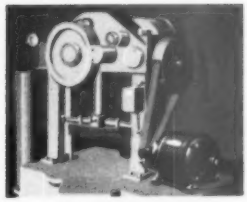
Extra protection that has been proved in more than 5 billion hours of rough-and-tumble industrial service.

WANT TO SEE FOR YOURSELF? Tri-Clad motors in nearly all types and ratings are ready for **IMMEDIATE SHIPMENT.** Contact your nearest G-E Office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

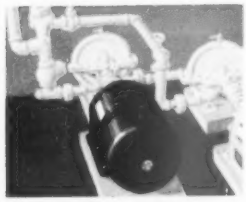
GENERAL ELECTRIC

760-8

There's a Tri-Clad motor for every industrial need!



G-E open (drippproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.



G-E totally enclosed motors for operation where dust or corrosive fumes are a hazard. From 1 to 1000 hp.

G-E capacitor motors for use on fans, blowers, pumps and compressors with single-phase power. From ¾ to 5 hp.

G-E Type ACA induction motors for adjustable speeds—provide 3 to 1 speed range. From 3 to 200 hp.

YOU CAN'T BEAT TRI CLAD EXTRA PROTECTION

LESLIE ENGINEERING DATA

MEMO: To Plant Engineer
Why Standardize on Leslie Reducing Valves

PLANT STANDARDIZATION ON REDUCING VALVES

1. DEPENDABLE APPROVED PERFORMANCE for all general plant steam services with 99% accuracy of Regulation. See Bulletin 461-A, PRESSURE REDUCING VALVES, Page 14, write for your copy.

2. WIDE RANGE OF ADJUSTMENT without changing springs or diaphragms makes practical one standard reducing valve and justifies stocking of all popular sizes.

Adjustable Reduced Pressure Range		Class	Sizes	Max. Inlet Pressure and Temperature	
Min. psi	Max. psi				
10	285	L-3	1/2" - 4"	300 psi	550° F.

A larger diaphragm and lighter spring are used for very low reduced pressures, 2 - 35 psi adjustable reduced pressure range (Class LL-3).

3. INTERCHANGEABILITY of Parts and Superstructures, a most important feature of a standardized article, has four important meanings described in Bulletin 468. Also see Parts List Dwg. L-223 F, Alt. 6.

4. LOWEST OVERALL COST PER OPERATING YEAR is assured by High Quality Material with longer, trouble-free performance and less maintenance.

   All internal wearing parts are renewable. The cylinder liner and flow-controlling parts are constructed of hardened stainless steel. The main valve seat ring is stellited (the most erosion resistant alloy known to engineers).

5. RECOGNIZED WORKMANSHIP of the highest quality in our own Foundry, Machine Shop, Inspection and Test Departments means controlled manufacture and assures a constant production of high quality material and full interchangeability of repair parts which are maintained in stock for all Reducing Valves manufactured since 1900.

Leslie Regulators have been used successfully since 1900 by industry of all types in the United States and Canada

LESLIE COMPANY
225 Grant Avenue, Lyndhurst, New Jersey
☐ *Please send me Bulletin —*
"Reducing Valves, How to Select & Install"

Name ..... Position .....
Company .....
Address .....
City ..... Zone ..... State .....

Lowest overall cost per operating year.

Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory trained engineers are located:

ESTABLISHED 1900 LESLIE CO.

Albany, N. Y.
Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Bridgeport, Conn.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Denver, Colo.
Detroit, Mich.
Fort Worth, Tex.
Greensboro, N. C.
Greenville, S. C.
Houston, Texas
Kansas City, Mo.
Kingsport, Tenn.
Lake Charles, La.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Mobile, Ala.
Montreal, Que., Can.
New Orleans, La.
New York, N. Y.
Orlando, Fla.
Philadelphia, Pa.
Honolulu, Hawaii
Pittsburgh, Pa.
Ponca City, Okla.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Rutherford, N. J.
San Antonio, Texas
San Francisco, Cal.
Savannah, Ga.
Seattle, Wash.
Spokane, Wash.
St. Louis, Mo.
Syracuse, N. Y.
Tarrytown, N. Y.
Toronto, Ont. Can.
Vancouver, B. C. Can.
Watervilie, Me.
Wilkes-Barre, Pa.
Youngstown, Ohio

PRESSURE REDUCING VALVES • PUMP GOVERNORS • PRESSURE CONTROLLERS
TEMPERATURE REGULATORS • SELF CLEANING STRAINERS • LESLIE-TYFON WHISTLES

Here's One Expense Cost-Conscious Management has cut—to Rock Bottom in these Days of Rising Costs

Year after year, industrial eye accidents embezzle your profits and cut your production by sidelining able men, putting machines in the hands of less experienced workers, lowering morale, hiking claims and insurance costs. All this on top of the cost of medical service!

Aware that 98% of industrial eye accidents are preventable, many companies have solved this problem by installing an adequate eye protection program with results like this: cost of eye accidents in year prior to program, $4,262.00; cost of eye accidents in first year of program, $204.59! Ask your AO Safety Representative how an AO Eye Protection Program can cut your costs.

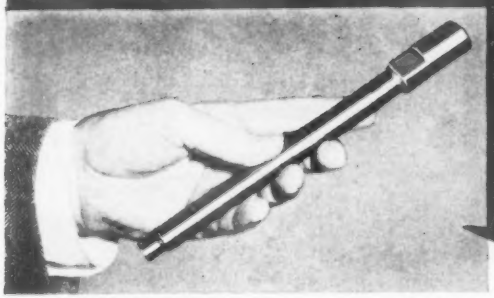
American Optical *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

ANNOUNCING...

THE "TRIPLE C" PLAN

to help you lower your BREAK-EVEN POINT!



"Doubled production! Held costs down despite rising wages! Savings made in the machining of this one part paid the entire cost of installing the plan!" Large midwestern manufacturer.

"Assures maximum tool economy and accurate grinding of intricate form tools so important . . . in a highly competitive field." Top-ranking Detroit manufacturer

Now! . . . get even greater savings from your use of carbide tools!

NOW it's ready for *your* plant!

A plan that combines *all* the elements of successful, efficient use of carbides by many prominent manufacturers!

Based upon years of field experience, Carboloy Company now offers *you* these valuable findings in a single plan of Coordinated Carbide Control (the "Triple C" Plan), *to help you obtain every possible production economy from your use of carbides!*

Break-even point too high?

Then this may be the most valuable message you could read today! Wherever the CCC Plan has been tested, wherever it has been put into effect, the results have been astounding:

The plan has doubled, and often tripled, machine production, lowered machining costs in the face of steadily rising wage and material costs—*with no increase in man hours or man-power, no plant expansion, no major capital expenditure!*

And "Triple C"—Coordinated Carbide Control—can be put into effect by your own men.

The results described at the top are *typical*. Names will be furnished on request.

Let "Triple C" help you

It's ten-to-one that the "Triple C" Plan can help lower your break-even point through greater savings. Write today for the free booklet describing the plan in detail. It's available to management executives of manufacturing companies. No cost or obligation.

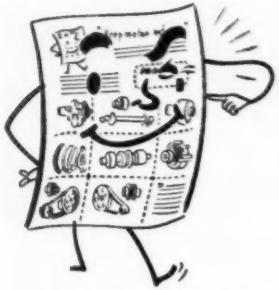
Carboloy Company, Inc., 11135 E. 8 Mile Road, Detroit 32, Michigan

THE CARBOLOY "TRIPLE C" PLAN — COORDINATED CARBIDE CONTROL

FOR EVEN GREATER SAVINGS WITH CARBIDES

CARBOLOY CEMENTED CARBIDES

1949 Carboloy Company, Inc.



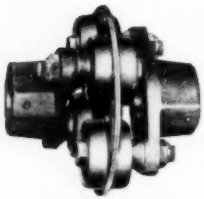
"Keep me for reference"

Here's your quick reference file for Morse Mechanical Power Transmission Products

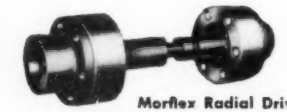
As a purchasing engineer, design engineer or maintenance man — here's help in getting the best in mechanical power transmission. In making your choice, use this handy check list of the basic Morse Chain line—the finest mechanical power transmission products available.

There are 20 Morse branches capable of giving expert engineering counsel on power transmission problems.

MORSE
MECHANICAL POWER TRANSMISSION PRODUCTS
A PRODUCT OF BW BORG-WARNER



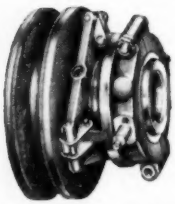
Morflex Couplings



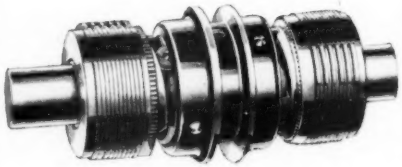
Morflex Radial Drive Shafts

Morflex Drive Shafts

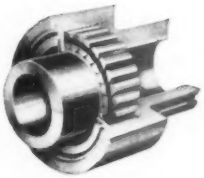
Morflex Radial Couplings



Morse-Rockford Over-Center Friction Clutches



Morse-Rockford Pullmore Clutches



Morse-Formsprag Over-Running Clutches

DSC Flexible Couplings

Silent Chain Drives

DRC Flexible Couplings

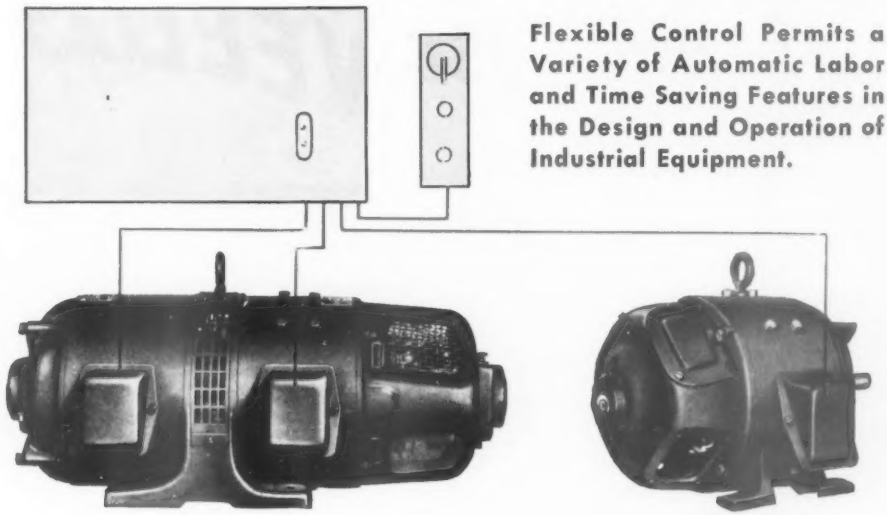
Roller Chain Drives

NOTE: Distributors—there's one near you—carry stocks from which quick deliveries can be made. Write Dept. 310, Morse Chain Company, 7601 Central Avenue, Detroit 8, Mich., for further information about any or all products.

Century SELECTIVE SPEED Drives

For Operation From Alternating Current to Save Time and Labor

Flexible Control Over a Wide Range of Stable Production Speeds



Flexible Control Permits a Variety of Automatic Labor and Time Saving Features in the Design and Operation of Industrial Equipment.

All or any combination of the following features may be specified with Century SELECTIVE SPEED Drives

1. **WIDE RANGE AND SPEED VARIATION** — 8 to 1 ratio is a standard — 16 to 1 or 32 to 1 is available.
2. **PRACTICALLY STEPLESS CONTROL** — Smooth acceleration and deceleration for any character of load.
3. **STABLE SPEEDS** — Even with varying loads.
4. **JOGGING CONTROL** — Jogging at preset speed is always available.
5. **PRESET SPEED CONTROL** — Automatically accelerates to speed preset by the control.
6. **DYNAMIC BRAKING** — For quick, automatic stopping or where controlled deceleration of load is required.
7. **REVERSING OPERATION** — Jog in reverse, or run in reverse, or both as specified.
8. **MULTIPLE DRIVING UNITS** — With related speeds controlled from a single control.
9. **CONTROL LOCATION** — "Start" — "Stop" — "Jog" — "Reverse" or change in speed may be controlled from any number of locations.
10. **TYPES OF REMOTE CONTROL** — Variety of control accessories may be incorporated into the functional design of your equipment to provide automatic time and labor-saving features.

Century SELECTIVE SPEED Drives are manufactured in sizes from 1 to 125 horsepower.

Call a Century motor specialist who will help you analyze your motor application problems.

Century manufactures a complete line of alternating current, single and polyphase and direct current motors and generators, 1/6 to 400 horsepower — 500 Watts to 300 KW. Popular types and standard ratings are generally available from factory and branch office stocks.

Century C MOTORS

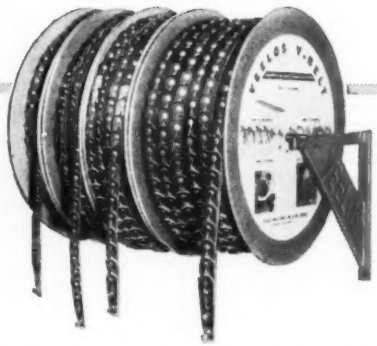
-614

CENTURY ELECTRIC COMPANY • 1806 Pine Street, Saint Louis 3, Missouri

Offices and Stock Points in Principal Cities

"Me . . . stock all those endless V-Belt sizes?"

"Not since I use VEELOS"



"I can replace any V-belt in our plant with just these reels of Veelos."

That's a typical Veelos user telling you how Veelos cuts V-belt inventory. If you use O, A, B and C widths, four reels of Veelos give you a choice of more than 316 sizes. Use only A and B? Then two reels are all you need.

Buying matched sets of endless V-belts is costly. Forget it with Veelos. Forget, too, belt deterioration and obsolescence. Veelos on reels saves storage space . . . simplifies stock records.

Veelos is quickly and easily installed. On drives with fixed centers or outboard bearings, Veelos is installed without moving the motor or dismantling the machine. It provides substantial savings in installation and maintenance costs.

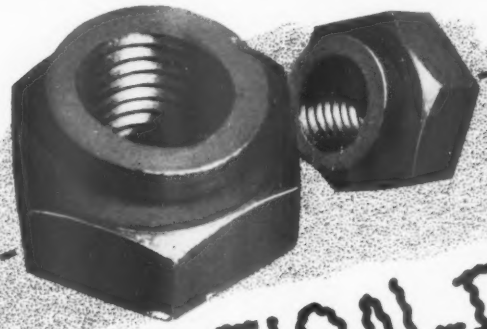
VEELOS
THE LINK
V-BELT

SEND FOR FREE VEELOS CATALOG. It shows how you can benefit from the many important advantages of Veelos. Fully illustrated. Complete engineering data. Write for it.

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PA.

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all standard sizes, fits all standard grooves. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 300 distributors throughout the country. Veelos is known as VEELINK outside the United States.



VIBRATION-PROOF!

¼" TO 2" DIAMETERS
PACKAGES OR BULK

PATENT No.
2,255,286

LAMSON LOCK NUTS

Does a product of yours have the "shakes"? Is it subjected to conditions where vibration is a major problem? If so, it will pay you to consider the use of inexpensive Lamson Lock Nuts.

These one-piece all-steel lock nuts have a heat-treated spring-grip locking collar which HOLDS the nut on the bolt under the most severe conditions of vibration. They will hold until backed off with a wrench and can be reused without loss of grip. Tests at 600°F. and -40°F. prove that neither heat nor cold materially affect their holding power. They are also unaffected by steam, oil or water.

Manufacturers of machinery, earth moving equipment, pumps, trucks and other products subjected to severe vibration have found Lamson Lock Nuts the ideal solution to their fastening problems. Write *today* for additional information.

THE LAMSON & SESSIONS COMPANY

General Offices: 1971 West 85th Street, Cleveland 2, Ohio

Plants at Cleveland and Kent, Ohio • Birmingham • Chicago

Lamson & Sessions

"One Dependable Source for All Fastener Needs"

SEMS	LOCK NUTS	NUTS	STUDS
STOVE BOLTS	LAG BOLTS	WASHERS	RIVETS
TAPPING SCREWS	ROPE CLIPS	SET SCREWS	PLOW BOLTS
"1035" CAP SCREWS	MACHINE BOLTS	CARRIAGE BOLTS	COTTER PINS

WANT MORE INFORMATION on any of these fasteners? CHECK—and CLIP this strip.

—CUT ALONG THIS LINE—

LAMSON LOCK NUTS: Economical, vibration-proof. Can be re-used repeatedly.

"1035" SET SCREWS: Cup point type, hardened, heat-treated.

COTTER PINS: Steel, Brass, Aluminum and Stainless Steel.

SPECIAL NUTS: Cone, Barrel, Oblong, Plier, Tri-Slot, Half-round, etc.

PHILLIPS AND CLUTCH HEAD: Machine Screws and Tapping Screws.

MILLED STUDS: Concentric, accurate, in a full range of sizes.

"BENT" BOLTS: Including U Bolts, Eye Bolts, Hook Bolts, etc.

WEATHER-TIGHT BOLTS: Eliminate counter-boring in wood assemblies.

PIPE PLUGS: Forged Steel, heat-treated.

The Lamson & Sessions Company
1971 W. 85th St., Cleveland 2, Ohio

NAME

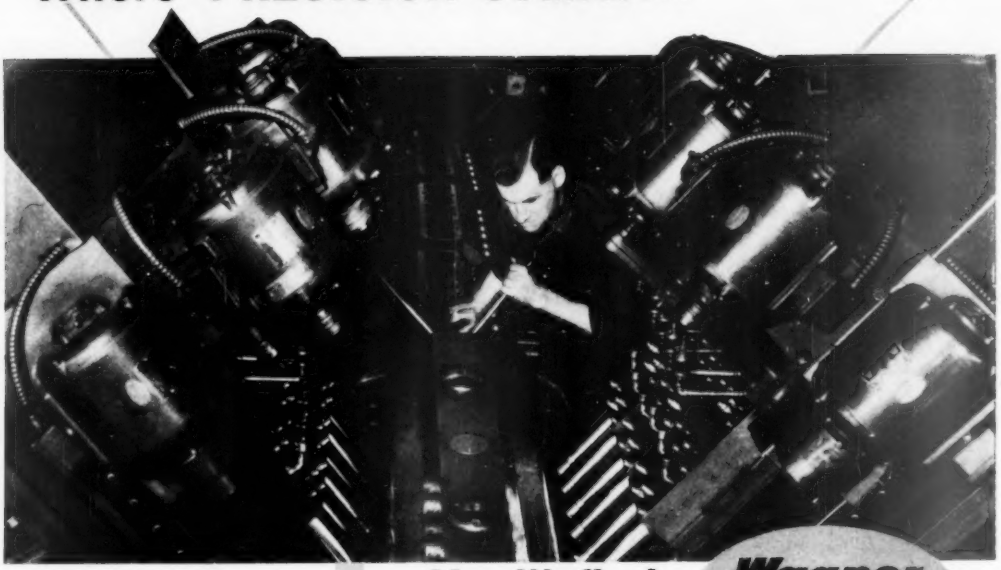
POSITION

COMPANY

STREET

CITY ZONE STATE

Where PRECISION *Counts...*



You'll find Wagner Motors on the job...

Totally-enclosed Non-ventilated Motor

Totally-enclosed Fan-cooled Motor

Real precision in a machine tool requires motors that operate smoothly, quietly and with minimum vibration. Wagner Motors are noted for these qualities and for long-lived dependability and economical operation as well!

That's why Wagner Motors have been used extensively and are recommended by many widely-known machine tool manufacturers. If you want your machine tools and equipment to operate with precision, and with a minimum of costly "down-time"—choose Wagner Motors, too. Bulletin MU-185 gives information on the complete line of Wagner Motors. Write for a copy.

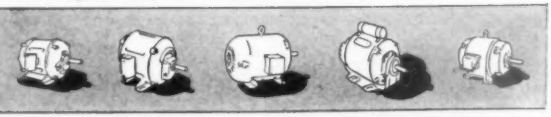
Buyers of Wagner Motors get Nationwide Service! More than 450 Wagner Authorized Electrical Service Stations and Parts Distributors augmented by 25 Wagner-owned Service Branches are ready to immediately supply on-the-spot service, factory guaranteed exchange motors, or genuine Wagner parts. Write for Bulletin MU-24 for complete list.

Wagner Electric Corporation

6412 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on all Electric Motor Problems

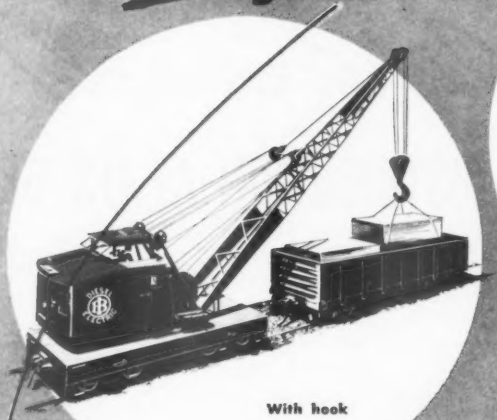
Wagner Electric Corporation EST. WE 1891



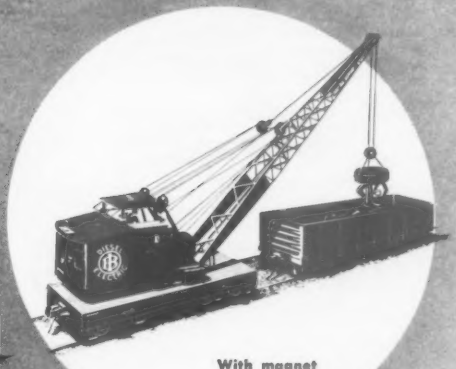
• ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE PRODUCTS •

M49-5

BROWNHOIST
let ~~George~~ do it!

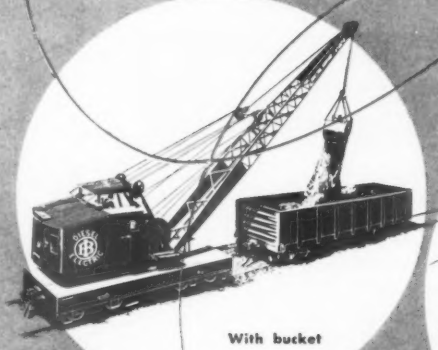


With hook

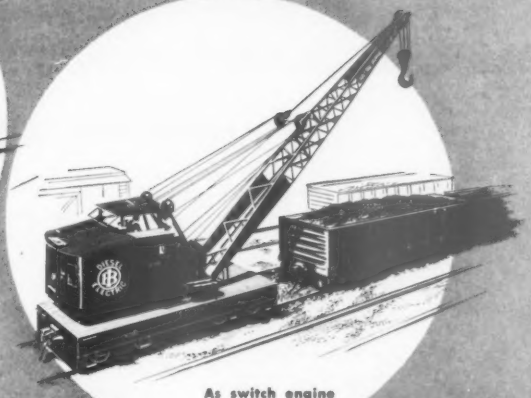


With magnet

"Let Brownhoist do it" has become the slogan in more and more industries where there's a tough materials handling job to do. The reason is simple. The new Industrial Brownhoist Diesel Electric Locomotive-Crane is a most versatile worker — it performs equally well as a switch engine or as a crane operating with magnet, hook or bucket. Standard models available to meet every capacity requirement. D.E.-30, D.E.-50, D.E.-60. Plan to reduce your materials handling costs, today, with a Brownhoist Diesel Electric Locomotive-Crane. Write for complete particulars.

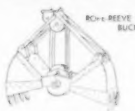


With bucket

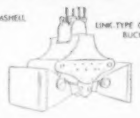


As switch engine

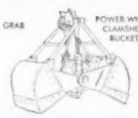
BROWNHOIST
builds better cranes



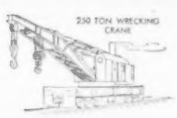
ROY-REEVE CLAMSHELL BUCKET



LINK-TYPE ORE GRAB BUCKET



POWER-WHEEL CLAMSHELL BUCKET

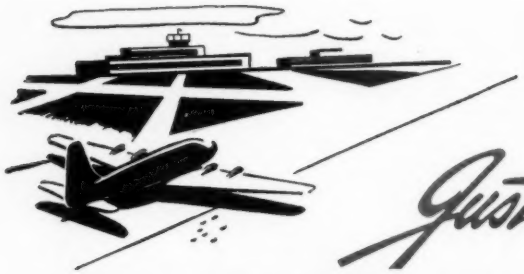


250 TON WRECKING CRANE

COAL—ORE BRIDGE

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN

DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago. **AGENCIES:** Detroit, Birmingham, Houston, Los Angeles, Portland, San Francisco, Seattle, Spokane. Canadian Brownhoist Ltd., Montreal, Quebec.

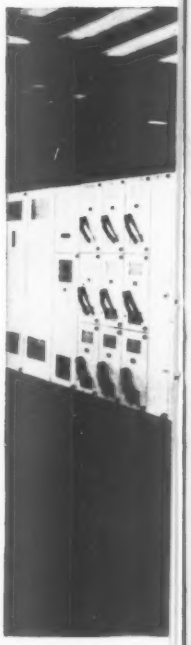


Just an example

BUT...IT'S POWER DISTRIBUTION AT ITS BEST!

. . . just a Dry-Type Power Center installed in a large eastern airport. The thousands of people who land and take off never see it. Yet, their very lives depend on it *and* the Power Distribution System of which it is a part.

These modern Dry-Type Power Centers are a part of the Spot Network System equipped by Westinghouse . . . a system chosen because reliability of service was of the utmost importance. Every vital operation of the airport depends on this reliability . . . from ground control approach equipment to crash and fire alarm system.



Modern Dry-Type Power Centers were chosen to assure Reliable and Economical distribution of power...

and here's why . . .

- Fire and explosion proof
- Costly vaults eliminated
- No liquids to maintain
- No maintenance of gaskets, valves and level gauges
- Can be located near center of load
- Separate breaker compartments
- Positive interlocking
- Draw-out circuit breakers quickly inspected
- All parts readily accessible
- Lighter in weight
- Installed as a unit
- "Unitized" design saves valuable floor space
- Factory assembled and tested . . . as a *unit*
- Undivided responsibility for manufacture and correct functioning of all equipment

Modern Westinghouse Dry-Type Power Centers can be supplied for use in any distribution system, whether radial or network . . . where the high voltage is 15 kv and below. CONSULT WESTINGHOUSE. Call your nearest Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-97136

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Yes . . . Every Industry's Problems ARE Different!

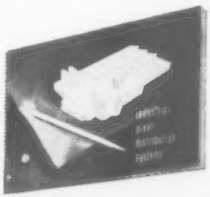
Nothing is more vital to industry than the Power Distribution Systems that provide the power for its machines. Thus, it is most important that the *best system* be selected and included in the basic planning for expansion or new building.

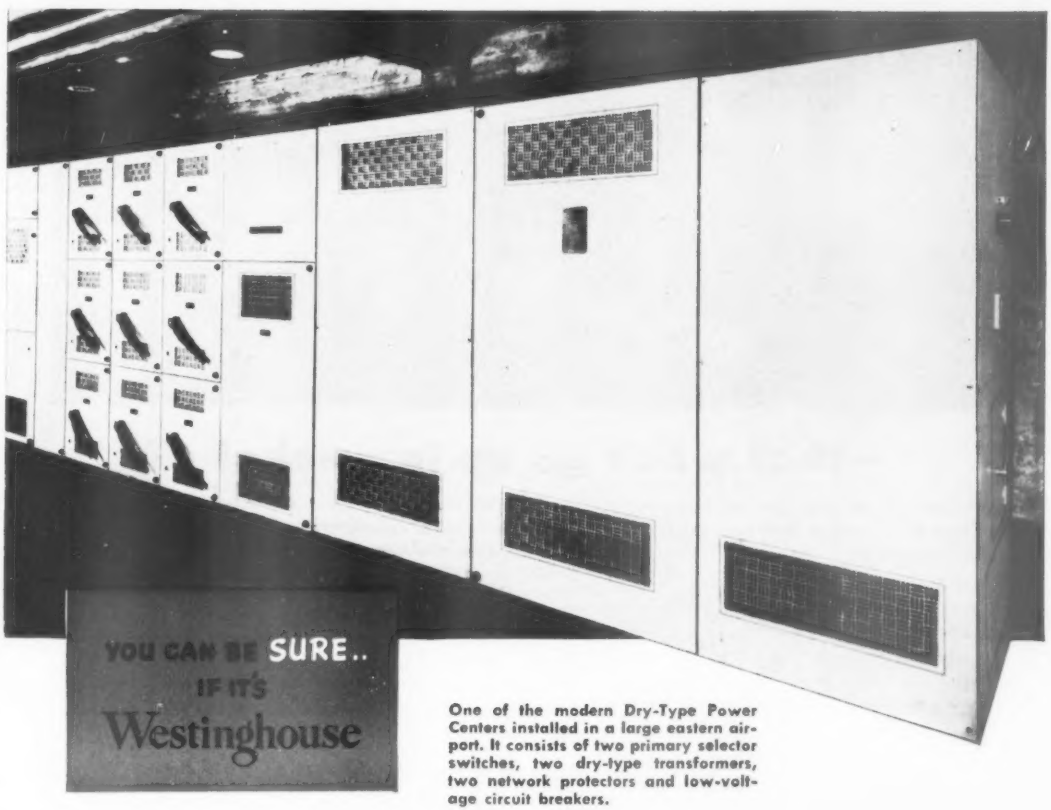
These problems vary greatly from industry to industry . . . from plant to plant. Meeting these problems for widely diversified industries has given Westinghouse an intimate knowledge of fields that undoubtedly closely touch *your* problems.

We can help *you* find *your* answer. New ways of distributing power to economically provide better voltage regulation, greater reliability, greater safety . . . these are a few of the problems for which our engineers have found new and better solutions.

* * *

Write for the new booklet *"Industrial Plant Distribution Systems"*. You'll find the fact-filled pages invaluable in choosing a power distribution system that best meets *your* requirements. Ask for B-4045.





One of the modern Dry-Type Power Centers installed in a large eastern airport. It consists of two primary selector switches, two dry-type transformers, two network protectors and low-voltage circuit breakers.

MODERN EQUIPMENT FOR MODERN DISTRIBUTION SYSTEMS

There's a cool $10,000,000 here...

—that won't go up in smoke!

Pack hundreds of costly furs into a storage vault—and you have an investment that takes a whale of a lot of watching!

At Merchants Transfer & Storage Co., Washington, D. C., the electric eyes of *Kidde* Smoke Detectors are *constantly* on watch. Supplemented by Heat Actuators, they send a *Kidde** automatic fire-extinguishing system into action at the first threat of fire. The system smashes the threat by flooding the vault . . .

With *water?* Not on fur coats that would turn into sodden masses! No, the *Kidde* system uses dry, clean carbon dioxide (CO_2) that's deadly to *fire*, harmless to *materials*.

The places in *your* plant where you store business documents—contracts, deeds, drawings, formulas, important correspondence—present fire hazards much like fur vaults. Your valuable papers *need* fire protection—but they're useless if water-soaked! For applications like this, CO_2 is the ideal extinguishing agent . . .

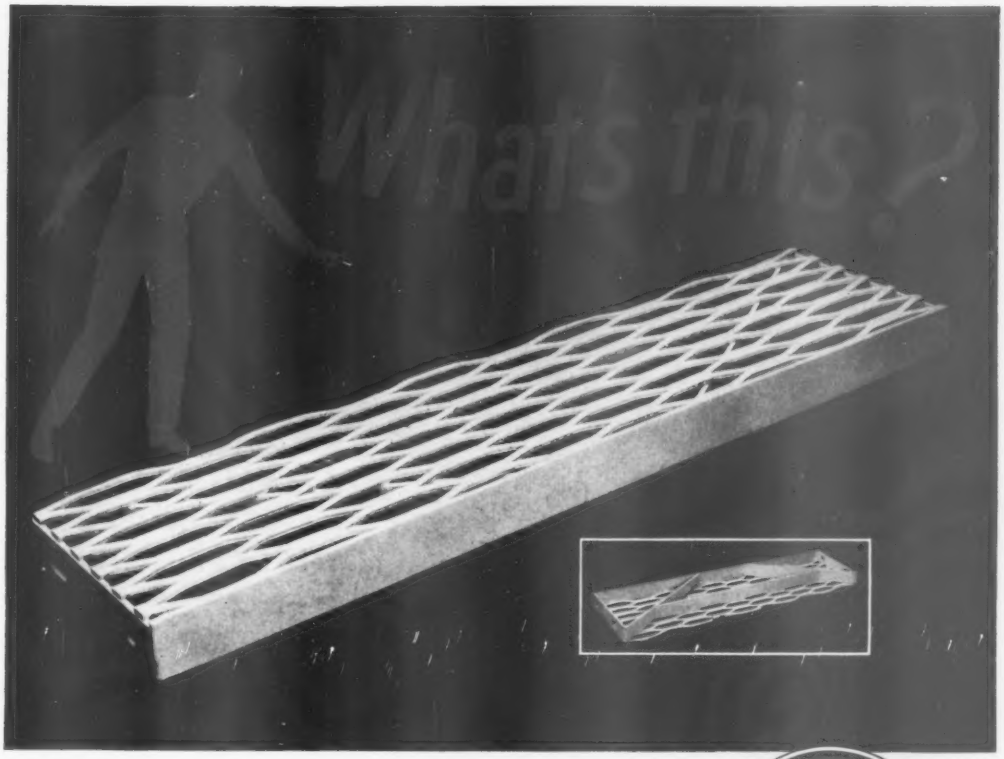
And when you think of CO_2, call Kidde!

*Also known as "LUX."

The words "Kidde" and "Lux" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc. • 332 Main Street, Belleville 9, New Jersey

Kidde



A strong non-skid stair-tread made of

WHEELING EXPANDED METAL

"Material of a thousand uses"

Wheeling

IT'S the perfect stair-tread . . . for cleanliness, for light and ventilation . . . for non-slip safety that may save a costly damage suit.

It's made of Wheeling Expanded Metal—the wonder material that solves so many architectural and industrial problems.

Wheeling "ExM" is made from solid steel sheets, slit and expanded to 5 times the original area, with no loss of strength.

It's light. It's strong. It ventilates. It admits light . . . permits vision. It's decorative. It comes in a wide variety of weights and mesh sizes.

It's perfect for partitions, shelving, machine and window guards, store displays, grilles, catwalks, storage racks, industrial trays, baskets, cages . . . hundreds of special uses.

Why not write for the whole story?

WHEELING CORRUGATING COMPANY

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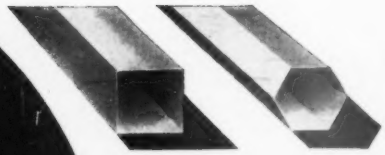

Forming a 6-inch diameter cylinder on a Cleveland Steelweld Press. Machines can be furnished for forming cylinders in lengths up to 20 feet.

SMALL DIAMETER CYLINDERS QUICKLY PRODUCED

Small diameter cylinders, square and hexagon tubing and other closed shapes are easily made with simple dies on Cleveland Steelweld Presses. Special steel dies are usually used for large quantities, but for small numbers a steel male die and a female pressure pad made of rubber is often used.

A series of successive bends are made starting at the ends of the sheet and finishing with the center bend. The dies are so made that the cylinder or tube when removed from the machine will spring to a closed position.

This is only one of the dozens of different jobs that can be done on any Cleveland Steelweld.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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STEELWELD

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SAVES $5000 in six months

G-E DIESEL-ELECTRIC LOCOMOTIVE SLASHES FUEL COSTS BY 89% AT TEXAS PAPER MILL

When the Southland Paper Mills put this snappy 45-ton diesel-electric locomotive into operation at the Lufkin, Texas plant about a year ago, the company did so on the strength of a modest savings estimate of $15 a day made by G-E engineers. Since then this cost-smashing locomotive has almost doubled this estimate *in just fuel savings alone.*

During six months' operation the diesel-electric saved $5000, at the rate of $27.65 per day. This is based on the $3.35 per day fuel cost for the G-E 45-tonner, compared with the daily $31.00 cost of bunker fuel oil for the replaced steam locomotive.

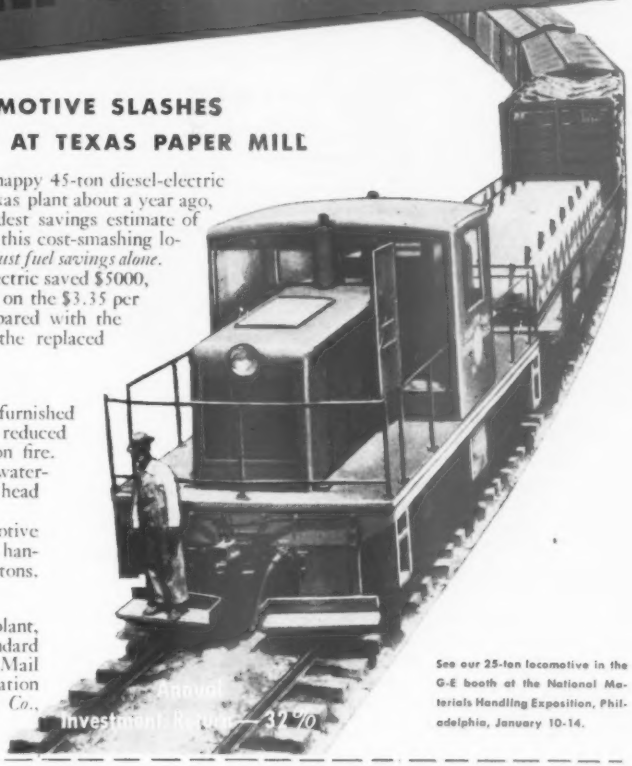
FIRE HAZARD ELIMINATED

In addition to savings, the G-E switcher furnished these other benefits. The absence of sparks reduced the danger of setting paper and pulp wood on fire. There's no longer any need to take time for watering. No watchman is required to maintain a head of steam.

Seven days a week, this peppy locomotive switches cars at the push of a button, often handling 15-car strings weighing over 1200 tons.

YOUR SAVINGS ESTIMATED

If you want to cut costs in your own plant, find out how many dollars one of these standard locomotives will bank for you each year. Mail the coupon for more information. No obligation of course. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



See our 25-ton locomotive in the G-E booth at the National Materials Handling Exposition, Philadelphia, January 10-14.

DO YOU HAVE THESE FACTS ON LOW-COST SWITCHING?

- Operating Results
- Graphs
- Tables

FREE BULLETIN

Section AD-4909
General Electric Company
Schenectady 5, N. Y.

Without obligation send me your fact-filled locomotive bulletin "Switch to Diesel-electrics and Save."

NAME .....
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GENERAL ELECTRIC

Why should your workers give a hoot about WINDOWS?

Windows mean a cool, refreshing drink of fresh air. Clear, work-easing daylight that helps prevent accidents. And perhaps most important—an occasional morale-lifting glance at the outdoors.

To you, that all adds up to one thing: Increased Production.

The way to get it—the better, more economical way—is with standardized Fenestra* Steel Windows.

They are designed to fit your needs.

Fenestra has a *right* window for every daylighting and ventilating job in your plant. For offices, too, and labs, warehouses and other buildings. Fenestra production volume permits standardization of a *large variety* of windows. That's why the cost is low . . . the quality so good.

They're sturdy—frame and vent corners are mortised and tenoned and air-hammer riveted. Fire-safe . . . warp-proof.

Shown here are three industrial types available in many heights and widths. Let us help you determine the best types for *your* needs. Write to Detroit Steel Products Co., Dept. FM-3, 2266 E. Grand Blvd., Detroit 11, Michigan.

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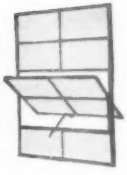
PIVOTED WINDOW

Widely used for an abundance of daylight, fresh air and see-through vision, to improve morale and production efficiency. Combine vertically or horizontally to form entire walls of windows.



COMMERCIAL PROJECTED WINDOW

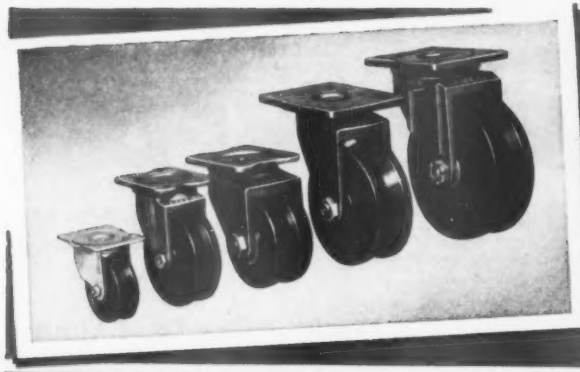
Popular for efficient, economical screening or shading—vents do not interfere. Open-out vent serves as a canopy over opening, protecting interior against rain; open-in vent is a built-in windguard, shedding water outside.

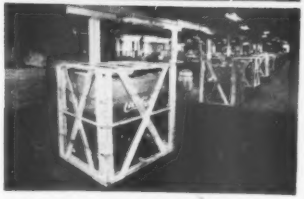
SECURITY WINDOW

A steel window with integral steel grille to bar prowlers. Passage of material is checked, too. Ideal for first floors, windows bordering fire escapes and windows near roofs of adjoining buildings.

Fenestra

INDUSTRIAL STEEL WINDOWS





The familiar red Coca-Cola dispensers made by the Cavalier Corporation, Chattanooga, Tenn., move swiftly and easily from assembly line to shipping room. Upper left: Finished units roll onto cable-drawn dollies equipped with Bassick Grooved-Wheel Casters running on angle iron tracks. Left center: Crated units move steadily along, without manual handling. Upper right: Showing how simply dolly is guided around curves — outside wheel on V-tracks, inside wheel on flat surface.

For smoother handling of its gas ranges and electric furnaces, The Montag Company of Portland, Ore., standardizes on Bassick Grooved-Wheel Casters and the simplest type of angle iron track. Photo at right shows V-shaped openings that guide wheels from floor to track.

Bassick Casters WITH GROOVED WHEELS

Speed Up Materials Handling On Inexpensive Angle Iron Floor Track

Throughout Industry, Leading Manufacturers Are Now Moving Materials Easier . . . Faster . . . At Much Less Cost . . . With This Simple, Flexible, Economical System.

In Bassick Grooved-Wheel Casters on angle iron track you have a materials handling system that is low in first cost, low in upkeep, and easily relocated to meet changing needs. This modern, money-saving method may greatly benefit *your* materials-handling operations. For further facts, write to THE BASSICK COMPANY, Bridgeport 2, Connecticut. DIVISION OF STEWART-WARNER CORP. *In Canada:* BASSICK DIVISION, Stewart-Warner-Alemite Corporation, Ltd., Belleville, Ontario.

Sold By Leading Industrial Distributors

A few of the many industries using Bassick Grooved-Wheel Casters: ***Aircraft . . . Automotive . . . Boat Storage . . . Ceramics . . . Chemicals . . . Food Processing . . . Foundries . . . Furniture . . . Lumber Yards . . . Metal Working . . . Prefabricated Housing . . . Small Boat Building, Etc.***

Making more kinds of Casters... Making Casters do more

Bassick

FIELD PROVED

Unique 9 Part Fabric

Its patented construction is entirely unlike any other. Scores of wires are stranded in 9 parts, then into three parts.

Interlaced By Machine

On special precision machines, originated by Union Wire Rope engineers, three three-strand parts are so interlaced as to form a sling fabric so much stronger, with so much tougher wearing qualities and with so much more flexibility that you just have to see how much longer service it gives to believe it.

Constructed To Prevent Rotating of Load

The inequalities of hand made slings are eliminated. The parts of Tuffy Sling fabric are so uniquely interlaced that they neutralize the load torque which causes rotating of the load on straight pulls.

Tested Strength Is Twice Safe Working Load Limits

Metal tags on Tuffy Slings give their safe working load. Each sling or leg of a bridal sling is proof-tested to twice this safe working load.

PATENT NO. 2,454,417

95% of Fabric Strength Is Developed In the Eye Splices

Here the unique interlacing of Tuffy scores again. It permits ready forming of eye splices possessing 95% of the strength of the sling fabric.

UNION WIRE CORP

unio
Wire Ro

Super
TOUGH

Ultra
FLEXIBLE

REG. TRADE MARK

TIES INTO KNOTS
WITHOUT MATERIAL DAMAGE

Tuffy Slings

Working any sling under load with knots or kinks in it is not recommended. But, sometimes it's unavoidable. Then is when the ultra-flexibility of Tuffy Slings stand you in good stead. Tuffy can take more of such punishment longer and you can straighten them out more often without material damage. The same is true of flattened eyes and because of the unique interlaced fabric construction, cutting of any one of the 9 strands will not result in stranding of the sling.

For a long time now, Tuffy Slings have proved they have the extra strength and ultra-flexibility to stand up during longer service on any kind of a load, under any kind of pull and with every type of hitch.

Try any one of the 9 factory packaged sizes. Prove their money-in-your-pocket worth to you to your own satisfaction.

Tuffy Sling Fabric also Available for Eye Splicing in Your Own Rigging Loft

If you are rigged for eye splicing your own slings, Tuffy Sling fabric is available on the reel. Your riggers will like the ease and speed of splicing that Tuffy interlaced construction affords.

n

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UNION WIRE ROPE CORPORATION

2234 MANCHESTER AVE. KANSAS CITY 3, MO.

☐ Send Facts on Tuffy Slings Including Safe Working Loads of 9 Sizes Which You Deliver as Complete Packages.

For Tuffy Slings—See Your Union Wire Rope Distributor (Listed in Yellow Section of Your Telephone Directory) and / or Send This Coupon.

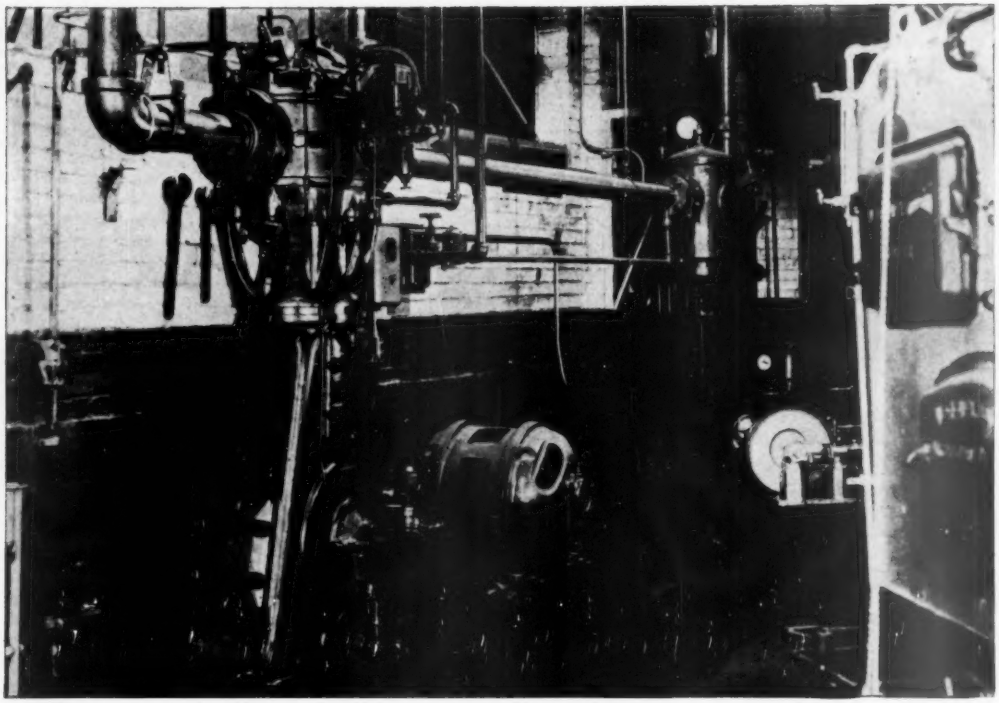
FIRM NAME_____

BY_____ TITLE_____

ADDRESS_____

CITY_____ ZONE_____

STATE_____



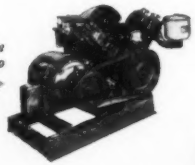
SAVE VALUABLE SPACE WITH THE EFFICIENT

JOY WG-9 HEAVY DUTY AIR COMPRESSOR

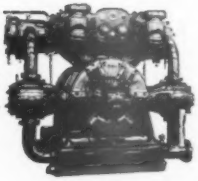
The vertical design and small base of the JOY WG-9 Compressor mean great savings in valuable floor space. Built in eleven sizes from 153 to 822 CFM, the WG-9 is designed for continuous heavy-duty service... features the exclusive JOY "Dual-Cushion" valves for top efficiency and lowest-cost operation. ● JOY builds the most modern compressors available for either centralized or decentralized air supply—*write for Bulletin.*

Consult a Joy Engineer

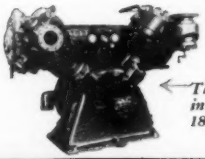
The JOY WL-80, in nine sizes from 81 to 590 CFM. →



The JOY WN-114, in single or twin units from 1092 to 7312 CFM. →



←*The JOY WN-112, in sizes from 378 to 1828 CFM.*



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JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

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8 A.M. EFFICIENCY

maintained **ALL DAY**
with **ORTON**

ONE-MAN

AERO-CRANE

POWERMATIC AIR-CONTROL

No Afternoon Fatigue Let-Down

One Man, with the Powermatic Air-Control Orton Aero-Crane loads and unloads cars, trucks, gets material onto the stockpile and off with *early-morning* efficiency *all day.*

Effortless Orton air-control enables one man with the Aero-Crane to handle 200 to 1000 lb. loads that eat up the time of a yard crew. Aero-Crane pays for itself in saved man hours.

Designed to SPEED Yard Work

Orton one-man Aero-Crane travels rapidly job to job with boom in any position.

Insures SAFE lowering of heavy loads against *compression of the engine.*

Full-view cab. Full circle turntable. Anti-friction bearings. Non-burn Orcoin V-type clutches. SAFETY spring-applied, air-released hoist brakes. Electro-welded construction.

Eight models, 3,500 to 60,000 lbs. capacity. Diesel or gasoline powered.

Send for Catalog 73-B for full details and roster of Orton world-wide users

◄ Long-life Orton Aero-Crane has most rigid car body of any crane built. Goes anywhere a truck will go. Operated, traveled and steered from craneman's seat.

ORTON **CRANE & SHOVEL COMPANY**
608 South Dearborn Street, Chicago 5, Illinois

Shut out shutdowns

Electrician inserts tap-off device into "Plug-In" Duct without disrupting production of other machinery on line. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

with "plug-in" power

DOES the high cost of power shutdowns keep you from making desirable machine layout changes in your plant?

There's no need to sacrifice either progress or profits. A BullDog "Plug-In" BUStribution system will give you power flexibility which can meet any possible plant change.

Plug in for power

With BullDog "Plug-In" BUStribution Duct, you can change machinery layout without costly overall power shutdowns. To move a machine, simply unplug its connection from the duct . . . move to the new location . . . and re-plug in the nearest "plug-in" outlet.

All other machinery on the line keeps producing during the change. No production stoppage is necessary, since there is no production line power outage. "Plug-In" Duct furnishes *live power* to all other machinery.

Complete flexibility

BullDog "Plug-In" Duct's flexibility goes even further. If plans necessitate a complete change in plant layout, the duct is 100% salvable. The entire system can be dismantled and set up to the new requirements, without scrapping a single part! Prefabrication makes even a complete overhaul like this simple.

Ask your local BullDog Field Engineer about "Plug-In" BUStribution. He will be glad to answer your questions. Let him show you an installation nearby.

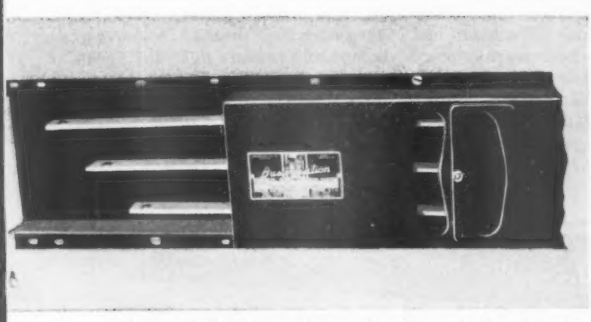
BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN—FIELD OFFICES IN ALL PRINCIPAL CITIES

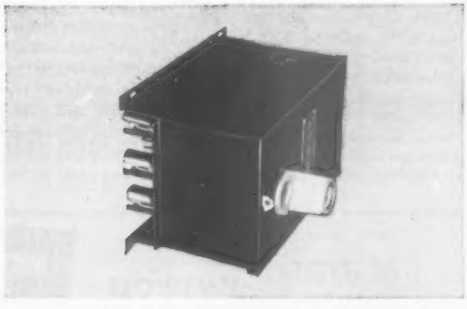
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION



Close up of "Plug-In" Duct, showing silvered-copper bus bars encased in steel sheathing. Crescent-shaped opening makes it impossible to plug in incorrectly. Capacity: 200 Amps. to 1000 Amps., 600 Volts or less, 2, 3 and 4 Poles.



One type of bus plug, showing "fingers" which grip bus bars in "Plug-In" Duct. Many types of BullDog bus plugs are available to answer your specific needs. Capacity: 30 Amps. to 600 Amps., 600 Volts or less, 2, 3 and 4 Poles.

THESE PLANTS BROUGHT PRESENT EQUIPMENT

UP-TO-DATE with

MICRO Precision Switches!

MICRO SEALED TYPE DIE CAST ENCLOSED PRECISION SWITCH

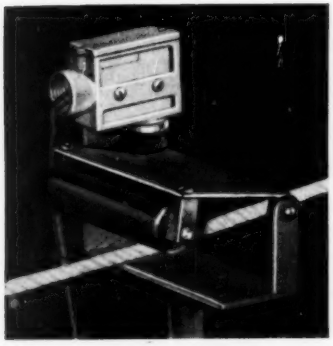
A popular design with plant managers, foremen, time study men and others faced with the need for modernizing plant machinery.

In modernization of present plant equipment, the use of MICRO precision switches has solved difficult problems for hundreds of industrial plants.

Use of MICRO precision switches has increased machine capacity, reduced repairs and work spoilage, and made it possible for one man to supervise the operations of more than one machine. The applications shown here are but a few of the thousands of uses for these accurate, precise, dependable switches.

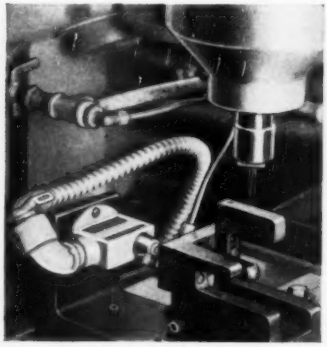
MICRO precision switches are provided with sturdy metal housings that are resistant to shock, dust and moisture.

MICRO SWITCH sales engineers, experienced in solving control problems in every type of industry, are conveniently located to help you with advice on the most practical and economical method of making your machinery more productive. Write to the MICRO SWITCH branch nearest to you, or to MICRO SWITCH, Freeport, Illinois.



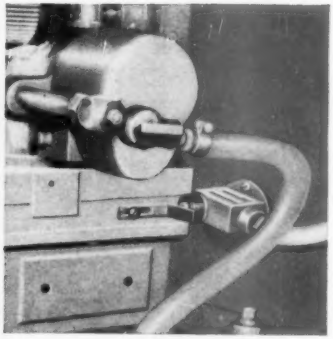
How to Save Costly "Slack" Trouble in Wire Winding

This sealed type MICRO precision switch is mounted on a device which allows this wire-winding machine to operate only when the wire passing through the roller is taut. Its installation completely eliminated broken needles, broken yarn and lost time which had previously developed whenever the wire became "slack." As soon as the "slack" is relieved, the wire tightens against the roller, and the switch starts the winding machinery in operation.



How to Save Time on Tapping Operations

Here a sealed type MICRO precision switch is used to assure proper positioning for tapping operations. It makes sure that the machine will not start unless the work has been properly positioned in the jig. Use of this switch has saved many rejects, reduced tap breakage, and saved overall tapping time. This type of arrangement is easily installed by a maintenance man or plant engineer.



How to Handle More Than One Machine At A Time

An arm on the carriage of this hobbing machine contacts a sealed type MICRO precision switch at the end of its travel. The switch stops the machine automatically, and turns on a light that signals the operator. He places new work in the machine, sets it in operation and goes about his duties at another machine. MICRO precision switches provide many ways to save time with present equipment.

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MICRO MS SWITCH

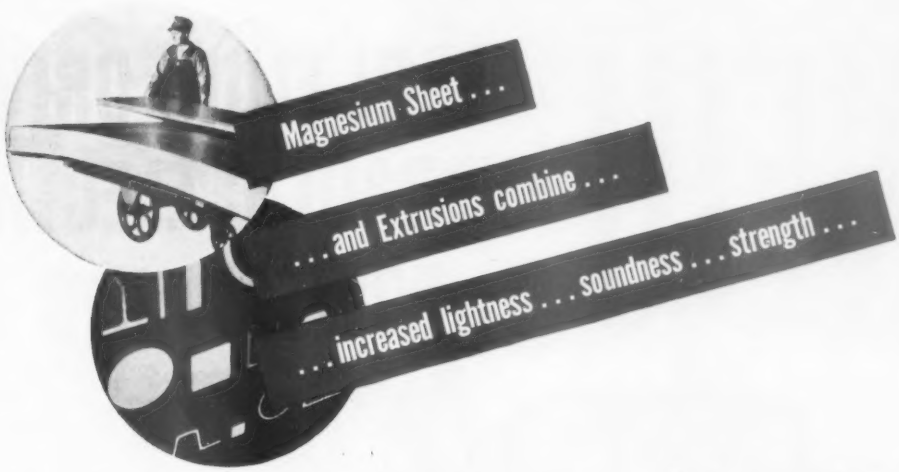
A DIVISION OF FIRST INDUSTRIAL CORPORATION

FREEPORT ILLINOIS, U.S.A.

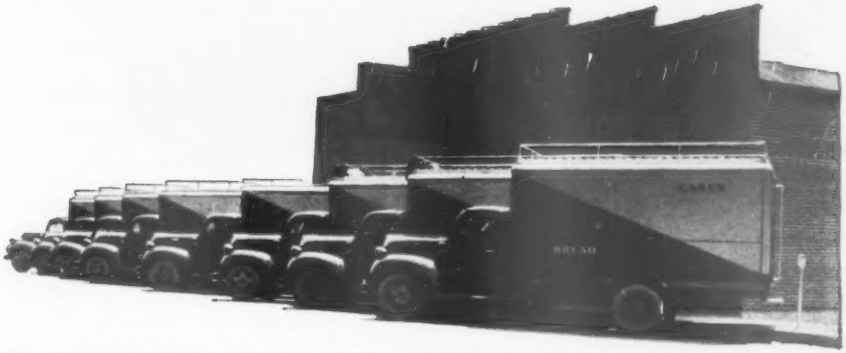
MICRO . . . first name in precision switches

BRANCH OFFICES: Chicago • New York • Boston • Cleveland • Los Angeles

SALES REPRESENTATIVES: Portland • St. Louis • Dallas • Toronto



They put the weight where it pays . . . into payload!



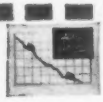
Efficient fleet owners know that there's not a penny of profit in hauling dead weight.

That's why this progressive operator equipped his trucks with magnesium bodies. He put the weight where it really pays off —into payload. With the world's lightest structural metal, body weight was reduced by more than half. The result: greatly increased hauling capacity plus real savings in delivery time, driver fatigue, and truck maintenance. The owner reports a saving of one cent per mile in over-all operating costs.

Here are two more significant facts about magnesium that are often overlooked. It is in inexhaustible supply and prices are more favorable than ever before. Translate these advantages into terms of smoother production and lower costs and you can readily see why more and more truck manufacturers are finding that Magnesium Pays.

Magnesium Pays

IN TRANSPORTATION EQUIPMENT



Write for the revealing free book "Hauling Costs Down." It's filled with facts about how fleet owners and truck body manufacturers have found that Magnesium Pays.

Send me the study MP-TB-16 "Hauling Costs Down" without obligation.

NAME _____

TITLE _____

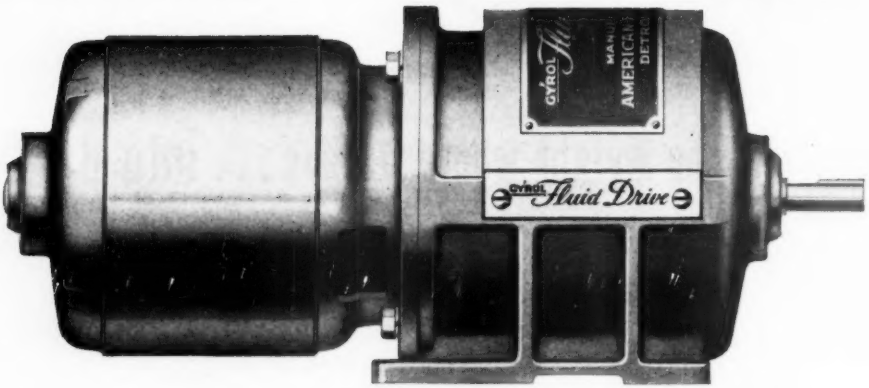
FIRM _____

ADDRESS _____

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle • Dow Chemical of Canada, Limited, Toronto, Canada

NEW GYROL FLUID DRIVE HYDRAULIC ELECTRIC POWER UNITS



S-M-O-O-T-H POWER

Now, for the first time, you can buy Hydraulic Electric Power Units with built-in Gyrol Fluid Drive for all your tough jobs requiring electric motors, such as—conveyors, centrifugals, mixers, winders, spinners, and other machines where low starting current, smooth acceleration, overload protection and shock absorption are highly desirable characteristics.

And you can get these new units, equipped with frames made to standard NEMA mounting bolt hole dimensions and powered by dependable, constant speed AC motors.

No on-the-job engineering is necessary. No expensive controls are required. Wiring is actually simplified. Read these advantages:

At the snap of a switch, the motor starts unloaded and comes up to 85% of full speed before starting the load. This saves more than 50% in current usually expended in starting. It eliminates the need to overmotor jobs . . . gives complete protection from shock to both motor and driven machinery.

Acceleration is positive but gradual, without vibration or jerking. There's no metal-to-metal connection between driving unit and driven machinery. Shocks are absorbed in a cushion of oil. Simply adjusting the oil level in fluid drive adjusts the degree of load transmitted by the motor.

Thus, Gyrol Fluid Drive insures longer wear, better performance and lower upkeep costs for your machines and motors.

Units powered with 5 and 7½ HP motors are available now. Other units, powered by 1, 1½, 2, 3, 10, 15 and 20 HP motors, will be ready for fall delivery. Ask your Power Transmission Dealer for prices and data. If he cannot supply you, phone or write the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
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AMERICAN BLOWER
GYROL Fluid Drive

Serving home and industry
AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON

It's New!

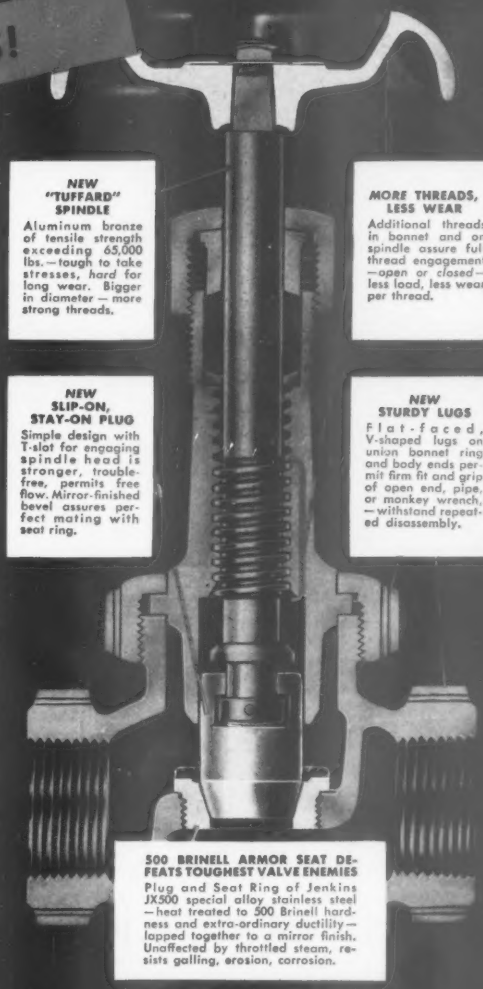
JENKINS ANSWER TO VALVE-KILLING SERVICES!

JENKINS Fig. 976-A

PLUG TYPE

Armor Seat

BRONZE GLOBE VALVE



NEW "TUFFARD" SPINDLE

Aluminum bronze of tensile strength exceeding 65,000 lbs.—tough to take stresses, hard for long wear. Bigger in diameter—more strong threads.

MORE THREADS, LESS WEAR

Additional threads in bonnet and on spindle assure full thread engagement—open or closed—less load, less wear per thread.

NEW SLIP-ON, STAY-ON PLUG

Simple design with T-slot for engaging spindle head is stronger, trouble-free, permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

NEW STURDY LUGS

Flat-faced, V-shaped lugs on union bonnet ring and body ends permit firm fit and grip of open end, pipe, or monkey wrench,—withstand repeated disassembly.

500 BRINELL ARMOR SEAT DEFEATS TOUGHEST VALVE ENEMIES

Plug and Seat Ring of Jenkins JX500 special alloy stainless steel—heat treated to 500 Brinell hardness and extra-ordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

300 lbs. Steam 600 lbs. O.W.G.

BUILT TO BREAK RECORDS FOR LONG LIFE

Now, for the most severe services, you can choose the new Jenkins Fig. 976-A with complete confidence that it will set new economy records. Use it for pressure regulation, bleeds, drips, and drains, or any close regulation of steam that threatens wire drawing. It will lower maintenance, last longer, where entrapped pipe chips, scale, or rust tubercles are a problem.

SMASHED PIPE CHIPS, WIRE, LEAVE NO SCARS

Steel pipe chips and 1/16" wire rod, with Brinell hardness in excess of 300, were crushed between the new Jenkins JX500 Plug and Seat Ring without leaving a scratch or dent. That's proof of super hardness!

Compare Fig. 976-A, part for part, and see why it's as nearly wear-proof, trouble-proof, and maintenance-free as any stock valve can be. Only a few of the dozen ways it's better are shown here. Get the complete story in the new folder. See why it's unrivalled for endurance and economy,—why it's your best buy in plug-type valves! Use coupon.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

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Types, Sizes, Pressures, Metals for Every Need

GET COMPLETE DETAILS—IN THIS NEW FOLDER

Mail Coupon Today!

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Please send Armor Seat Valve folder—Form 193

Name .....

Company .....

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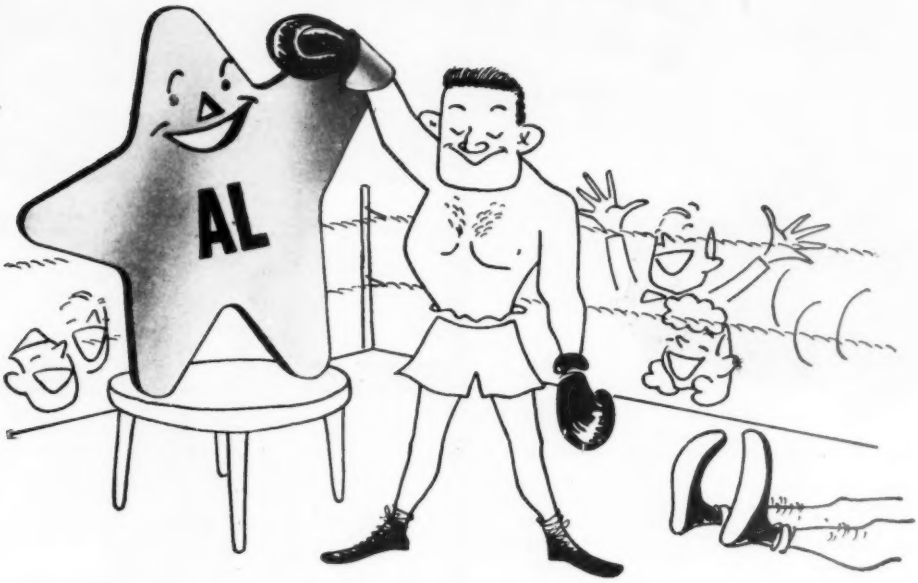
You're getting stiffer competition so be *more competitive!*



● Now's the time to design Allegheny Metal into your products, and get the jump on the field! This time-tested Stainless Steel adds new beauty, new service life—often at little or no added cost —and what's more, Allegheny Metal is available ...you can get the jump on the steel shortage, too!

Complete technical and fabricating data—engineering help, too—yours for the asking.

ALLEGHENY LUDLUM STEEL CORPORATION

The Nation's Leading Producer of Stainless Steel in All Forms

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Allegheny Metal is stocked by all Jos. T. Ryerson & Son, Inc., Warehouses

Take a Tip— buy a ZIP!

WHY settle for anything less? The Zip-Lift is the real wire rope electric hoist — with full magnetic push-button control — and the top-notch qualities you'd expect only in the most expensive hoisting equipment.

If you have heavy loads (anything up to 2,000 lbs.) you can't lose with a Zip-Lift. It starts earning the moment you hang it up on hook, jib or trolley — pays for itself several times a year. Why postpone the savings it brings you? Add a new Zip to your production — now!

Ask for your copy of Bulletin H20-3. It covers everything you want to know about the P&H Zip-Lift — applications, pictures, specifications, etc.

These are Added Values!

SAFER—Control current is reduced to 110 volts at the push-button. Crane type limit switch and double brakes provide maximum safety.

LIFETIME CONSTRUCTION — Shaved gears — grease-sealed bearings — precision construction — moisture-proof, dust-proof, acid-proof.

SMOOTHER OPERATION — Motor specifically built for hoist service — high starting torque, frequent reversal, etc. Controls loads within a fraction of an inch.

ALERT SERVICE — Out-of-stock delivery from qualified dealers everywhere — backed by 18 branch offices and 8 conveniently located warehouses.

The Zip-Lift is America's fastest selling wire rope hoist.

Handle it "thru-the-air" at lower cost

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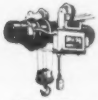
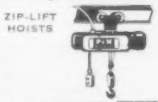
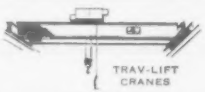

HEVI-LIFT HOISTS



ZIP-LIFT HOISTS


TRAV-LIFT CRANES

HEAVY DUTY CRANE

Plymetl will help you increase the performance and salability of your products

Haskelite* Plymetl unites plywood's great rigid strength and light weight with the tensile strength of sheet metal. The many users of Haskelite Plymetl find it a material with a flat, smooth, ripple free surface that adds new eye appeal to the products they use it on.

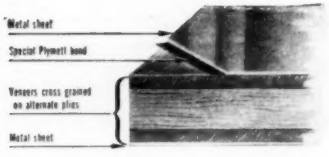
In addition, its great rigidity permits the type of construction that is conspicuous by the absence of numerous or complicated framing members. This factor effects a further saving of deadweight over that already saved through the use of the material itself, and often eliminates man-hours of fabricating time.

If you wish to add a new high standard of eye appeal and reputation building performance to your products — specify Haskelite Plymetl. Write for your free copy of "Plymetl—a material of opportunities."

*T.M. Reg.

CUTS WEIGHT AND BULK — SIMPLIFIES FABRICATION

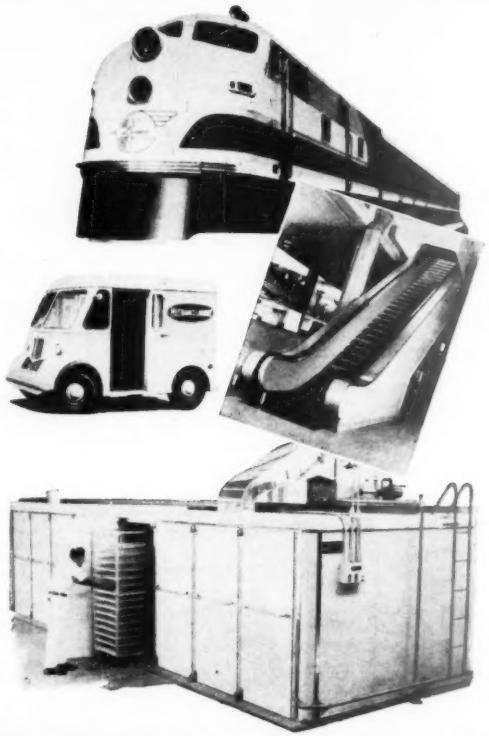
PLYMETL



Plymetl consists of light gauge metal sheets permanently bonded to one or both sides of a plywood panel. Sheets of zinc coated steel, aluminum or other metals may be used. One type of material may be bonded to one side of the panel, and another type to the other if desired. Panels of Haskelite Plymetl are easily fabricated with simple metal or wood working tools. It may be obtained in a range of thicknesses and sizes to fit specific requirements.

TYPICAL USES

Diesel locomotive side panels, escalator panels, table tops, truck trailer side panels, delivery truck bodies, railway passenger car interiors, bakery proof boxes, bread coolers, air conditioning equipment, low temperature drying ovens, etc.



HASKELITE T.M. Reg. *structural materials for men who build better*

HASKELITE MANUFACTURING CORP. DEPT. MM GRAND RAPIDS 2, MICHIGAN

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Here is the dependable, economical flexible metal hose for a wide range of applications

REX-TUBE

convoluted flexible metal hose

Where adaptability, durability and economy must be considered in the selection of flexible metal hose, CMH Rex-Tube should be the answer. Rex-Tube is made in eight basic wall formations for countless applications from protective conduit to conveying steam and liquids. Types of construction include square locked, double groove (ball bearing design) and fully interlocked. A variety of base metals and choice of packings are available. Couplings are available for each hose type as required. Write for complete information and specification sheets on the hose type best suited to your requirements.

Rex-Tube is one of the *basic types* of CMH's extensive line of flexible metal hose products.

A FEW OF THE MANY REX-TUBE APPLICATIONS

Conduit • Capillary Casing • Ducting • Exhaust Tubing • Low to Moderate Pressure Oil and Steam Lines • Vacuum Tubing • General Utility

"FLEXON" identifies CMH products, which have served industry for more than 45 years.

"the science of **FLEXONICS** . . ."the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion". . . is exemplified in the basic products of Chicago Metal Hose Corporation.

CMH FLEXIBLE METAL HOSE

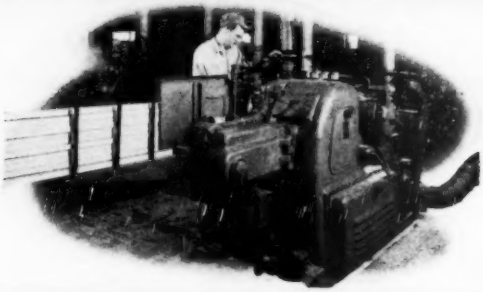
CHICAGO METAL HOSE CORPORATION

Maywood, Illinois

Plants at Maywood, Elgin and Rock Falls, Illinois

Put this **WINNING COMBINATION** *to work for you!*

Hines EXPERT ENGINEERS



Hines MODERN MACHINES

Hines LUMBER SUPPLY

PROTECTED QUALITY — THE NAME OF HINES — HINES LUMBER — FROM TREE TO YOU

Which one of the three—engineering, production, lumber procurement—is bothering you? Hines is ready and able to solve any one of your problems as far as wood is concerned —or take over the complete job of wood parts production. We are doing a money saving job for many large manufacturers and are ready to go to work for you. If you are interested in cutting costs, phone, write or wire today!

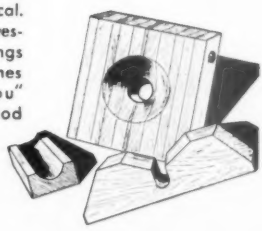
EDWARD HINES LUMBER CO.

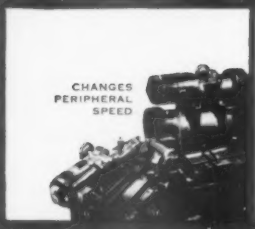
ENGINEERED FABRICATION DIVISION

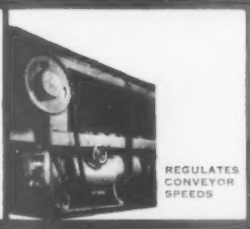
2431 So. Wolcott Ave., Chicago 8, Illinois

WOOD PARTS IN ALL SHAPES AND SIZES

• In many cases wood is better and more economical. It will pay to investigate the savings effected by Hines "forest to you" service on wood parts.







These are only a few of the many, many types of applications where Master Speedrangers can help you do a better job. These Speedrangers with their stepless variable speed operation assure exactly the right speed for every operation . . . for each operator . . . the right speeds for each change in the consistency or shape of the material being processed. Such variable speed operation gives you plus value in higher rates of production, a better quality product and more efficient performance of your equipment and your operators.

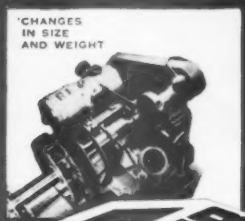
Master Speedrangers provide this infinitely variable speed in compact, all-metal, mechanical variable speed units in a wide range of types and in sizes up to 5 horsepower.

make a good job better

An extra feature of Master Speedrangers is their extreme flexibility, for they can be made to incorporate an electric motor, a variable speed unit, a gear reduction unit and an electric brake . . . all standard Master units that easily combine into a compact, integral power package. This provides exactly the RIGHT horsepower, the RIGHT range of speed, the RIGHT features, in a unit that you can use RIGHT where you want it.

Write for Data 7525, a new 24-page book on Speedrangers, and see what a real job they can do for you.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



MASTER SPEEDRANGERS

1

more work

2

more kinds of work

3

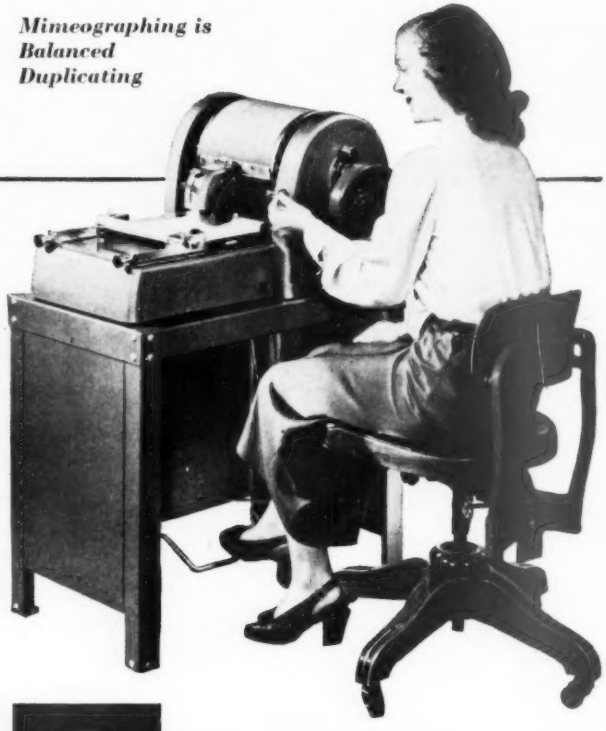
in less time

4

with less effort

In one minute you can have more than 100 clear, sharp, black on white copies of written, typed and drawn material. The new table-top model 435 A. B. Dick mimeograph with built-in motor is engineered for fast production. It is shown here with the model 27 A. B. Dick stand which provides foot control and allows the operator to remain comfortably seated during the entire mimeographing cycle. This machine, for use with all makes of suitable stencil duplicating products, has full Flexamatic Control to handle a variety of paper and card stock in sizes from 3 x 5 inches to 9 x 16 inches. Look in the phone book or write for the name of your nearby A. B. Dick representative and ask for a demonstration. A. B. Dick Company, 720 West Jackson Boulevard, Chicago 6, Illinois.

Mimeographing is Balanced Duplicating



HERE ARE MORE FEATURES

Easy, fast-loading feed table with 125-sheet capacity. Exclusive Roto-Grip Feed quickly set to feed automatically a great variety of paper and card stocks. Closed cylinder houses semi-automatic ink distribution and recovery system. Three-way copy adjustment. Universal stencil clamp.

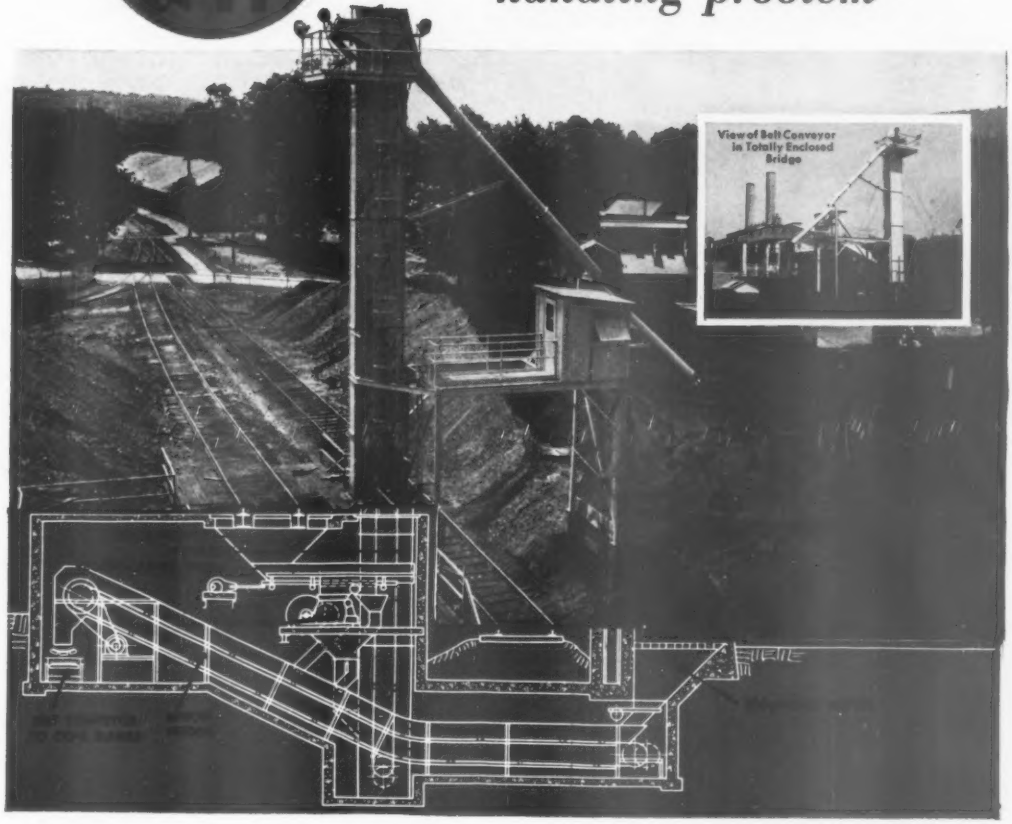
UNIVERSAL FEED TABLE

Available at extra cost. Simplifies hand feeding collated sets of irregular sizes of paper and card stocks.

A. B. DICK

the first name in mimeographing

went *Underground* to *Overcome* this handling problem



More steam power for peak production at the Picatinny Arsenal, Dover, N. J., called for more coal—more in reserve, more flexible equipment for handling it.

Problem was how best to augment existing facilities to meet this greater demand. A Gifford-Wood engineer looked over the ground—recommended the versatile handling system shown. It provides tremendous reserve storage in addition to bunker storage.

Note how new G-W system can take coal directly from track hopper—(1) through crusher to apron feeder, then by belt conveyor to boiler house bunker, or—(2) by bucket elevator and swivel chute to ground storage. Coal is reclaimed by drag scraper from ground storage and conveyed to bunker by use of the *same* system.

But this is only one of scores of instances where G-W took over the complete job—design, construction and erection . . . shouldered all responsibility. For G-W materials handling experience dates back 140 years . . . definite assurance that consultation with a Gifford-Wood engineer can help *you* solve *your* coal handling problems.

G-W HANDLES IT . . .
faster • easier • cheaper

SINCE 1814

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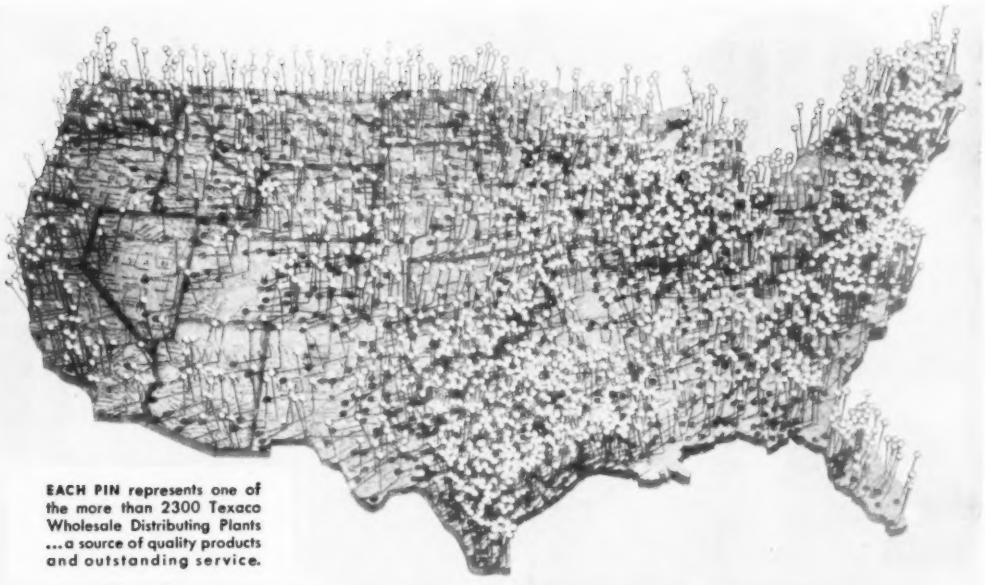
Factory:
Hudson, N. Y.

CHICAGO 6
565 W. WASHINGTON ST.



EACH PIN represents one of the more than 2300 Texaco Wholesale Distributing Plants ...a source of quality products and outstanding service.

"What a lubrication set-up!"

"No wonder Texaco is helping so many plants increase production and reduce unit costs!"

LOCATE your plant on the map above. Wherever it is, you'll find a Texaco Wholesale Distributing Plant nearby. That means you're close to a source of quality lubricants and outstanding lubrication engineering service, to help you step up your production, step down your manufacturing costs.

Texaco Lubrication Engineers work with production men in plants of every type and size, in every industry, throughout the 48 States. They know the ins-and-outs of production under all conditions. *Your* Texaco Lubrication Engineer can draw on all the resources and experience of this unique, nationwide set-up.

Call in a Texaco Lubrication Engineer to help map a money-saving lubrication program for your plant. Just contact your local Texaco Wholesale Distributing Plant, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants, Fuels and Lubrication Engineering Service

Tune in...TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

"Give us the tools . . ."

Now is the time to *FIGHT SOCIALISM* in Washington

Do we want to follow Britain down the economic skids?

We Americans face that question today. For we are being advised by Administration economists in Washington to take the course which destroyed Britain industrially. It is the temporarily easy course of cutting down expenditures for tools in order to have more things to consume right away.

The President's Council of Economic Advisers tells us we are spending too large a part of our national income on new tools and equipment. A larger share, they say, should go for goods and services used directly by consumers.

Before we take that advice, let us look at Britain. When the British once allowed their industrial plants and equipment to run down – they started down a dreary road to industrial stagnation and decay.

British industry once ruled the world. Low production costs enabled it to undersell all competitors. Efficiency gave British workers the highest living standards anywhere.

Now all that Britain has between it and economic disaster is pluck and American aid through the Marshall Plan.

The British people are living poorly – still on rations and in austerity. With practically everyone working, and working longer hours than we do in the United States, they cannot produce enough to pay for the raw materials and food they must import.

How did Britain get in this fix?

The story is complicated. British sacrifices in two wars play a tragic part in it. But another fact also stands out:

Britain began to go downhill even before World War I – when British industries allowed their plants and equipment to grow obsolete.

Once that process started, it grew steadily worse. By 1929 the share of Britain's national income being plowed back into capital investment had shrunk to less than two-thirds of what it had been twenty years earlier. We were putting twice as big a share of our national income into capital goods at this same time.

Skimping on capital equipment – on new plants and new tools – put the skids under industrial Britain.

World War II only speeded up a process already well under way.

continued on next page

British industry today shows the results of its failure to keep up to date. Here are three examples found by Dr. Laci Rostas, Britain's leading authority on measuring workers' productivity:

An American produces *four* times as much pig iron as his British counterpart.

He produces *more than four times* as many tires.

In all industry, on the average, an American produces almost three times as much.

The real reason is the American's better tools. The British are struggling with equipment that is, on the average, forty years old.

Britain once had a big head start in industrial equipment. But she let it slip away. And as it went, Britain's industrial and political leadership slipped with it.

How could British leaders have slept while all this happened?

This too, is a complicated story. But parts of it stand out clearly:

1. *British business men put in more time perfecting cartels to avoid competition than they did in improving their plants and equipment to meet it.*

2. *British labor leaders concentrated on sharing the work and sharing the wealth—rather than doing the job necessary to have enough wealth to make the sharing worthwhile.*

3. *British governments taxed away the means to buy new equipment. By steadily increasing personal taxes, they undercut the* ability *of individuals to invest in new equipment. Finally, they took away the* incentive *to get new equipment by progressively taxing away any returns on it.*

4. *Farseeing socialists smiled all the while, knowing that as private industry more and more lacked the tools to do a progressive job, they would have their chance to run the country.*

Now, with Britain's fate in their hands, the socialists are trying desperately to stem the nation's economic decline by rebuilding its industrial plants and equipment.

They are making a little headway, but not enough. There are several reasons. One is that Britain must export most of the new equipment she can make. *Another major reason—increasingly important for her future—is that money needed to renovate Britain's run-down industry is taxed away to support welfare programs.* The (London) *Economist* grimly puts it this way:

"The importance of the function of saving has only been discovered now that the means of saving have largely been destroyed."

Our own Federal and State governments, too, have dangerously whittled away incentives. They have more than tripled tax rates on personal and corporation incomes in the last twenty years. Now, the President proposes to do more whittling.

If the United States is not to go Britain's way, we must preserve our incentives to save and to invest in industry.

If the United States is to progress, we must continue to build up our industries.

The President's Economic Advisers say we can slow down. But the McGraw-Hill survey of "Business' Needs for New Plants and Equipment," reported in the previous editorial in this series, produced facts to the contrary. It showed that industry *now* plans—*if it can get the money*—to spend $55 billion in the next five years for new plants and new tools. Moreover, it showed *industry's needs* for new facilities are large.

By cutting down the incentives to save, by giving soothing advice that we do not need to save so much, Washington is pushing us toward Britain's way—the route via industrial stagnation to socialization.

Before we skid too far, we should pull up short and ask ourselves: Do we want to go Britain's socialistic way?

There still is time to say, "No."

A complete report on our national survey, "Business' Needs for New Plants and Equipment," may be obtained by writing McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y. This is the fifth editorial of a special series on industry's needs for new plants and equipment.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

Cost Reduction Is Still the No. 1 Job

EXCEPT FOR THE WAR YEARS cutting costs has always been management's most important job. It still is. The very survival of many concerns in this year 1949 depends upon their ability to hammer down costs.

The basic reason why lower costs are of crucial importance is plain. Demand and supply, over the economy as a whole, are coming more nearly into balance than at any time since the close of the war. The transition from sellers' to buyers' markets has been completed in all but a few lines like steel and automobiles. And reports show that even steel and automobile customers may be calling the tune before long.

So beginning right now the going will get tougher and tougher. The plant whose break-even point may once have been at 50 or 60 per cent of capacity may find it has to operate at, say, 80 per cent of capacity merely to stay in the black, let alone make a profit.

Cost-Reduction Tools

Fortunately there are accepted cost-cutting tools well known to management and ready for its use. Every plant operating man can reel off his own list. It would include better layout of plant and machinery, more extensive use of mechanical handling equipment, introduction of better methods, closer scheduling, more effective control of quality. Supervisory training and incentives for workers would be on the list. So would proper maintenance of plant and equipment.

Why, then, hasn't management done a better job of cutting its costs? Why does so great a need still exist?

For two reasons. First, cost reduction is a continuing program. The job is never finished. No matter how low costs may be, no matter how much costs have already been reduced, further reductions are always theoretically possible. It is therefore management's responsibility—to its employees, to its customers, and to itself—to organize a formal and continuing cost-reduction program.

Obstacles to Cost Reduction

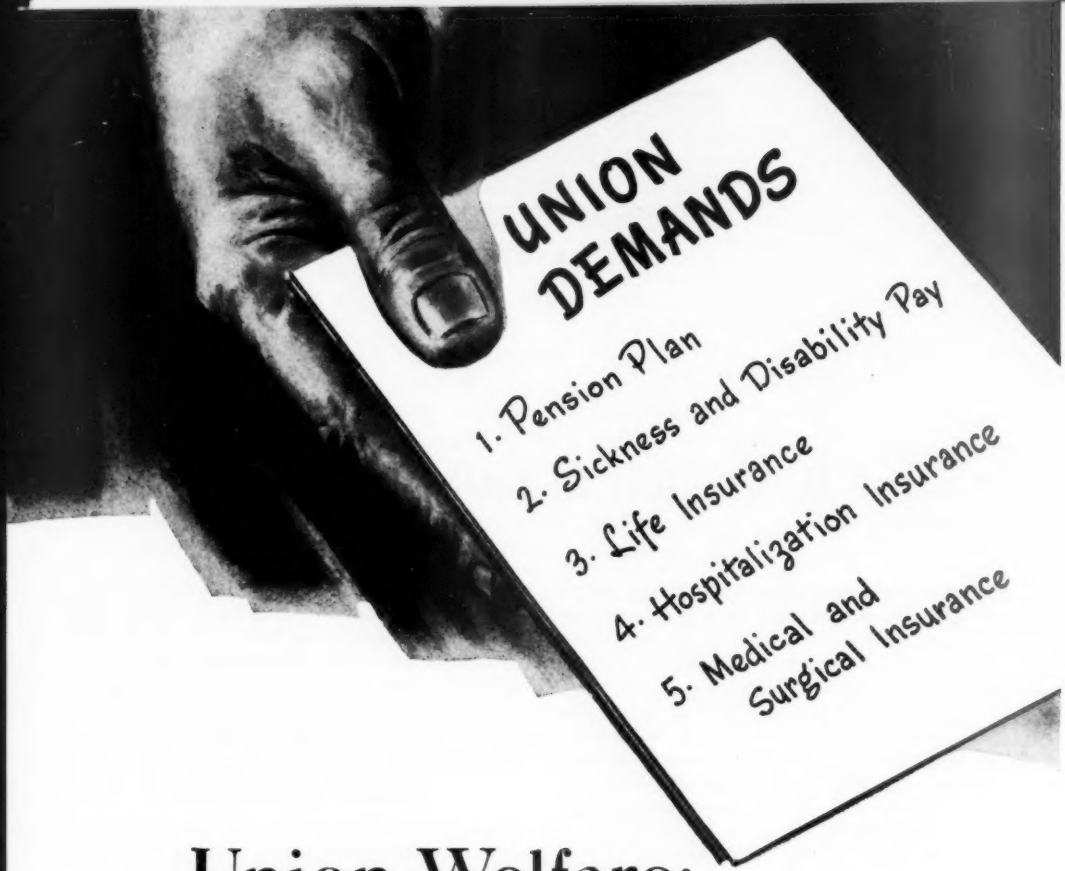
Second, there are certain obstacles to cost reduction present to a greater or lesser degree in every industrial situation. Again, the plant operating man can write his own list, but he will probably find that the obstacles fall into five main classes:

1. Resistance to change.
2. Deliberate restriction of output.
3. Lack of education and training.
4. Limitations of plant and equipment.
5. Financial obstacles—high taxes, low depreciation rates, shortage of working capital.

It is therefore the further responsibility of management to recognize the obstacles that are preventing it from doing as good a cost-reduction job as it knows how to do—and to take positive steps now to overcome them.

What has made the high standard of living in this country has been industry's ability to achieve more output of its products with less input of human energy, materials, and power—with consequent production of more and more goods and services for more and more people.

Never before has the prosperity of our country been so dependent upon industry's will to achieve this end.



Union Welfare: What It Means, What It

Organized labor's double-barreled drive for welfare benefits in 1949 promises management a hatful of headaches.

The first attack—*on Congress*—has already been launched. Its objective is a cradle-to-grave security program.

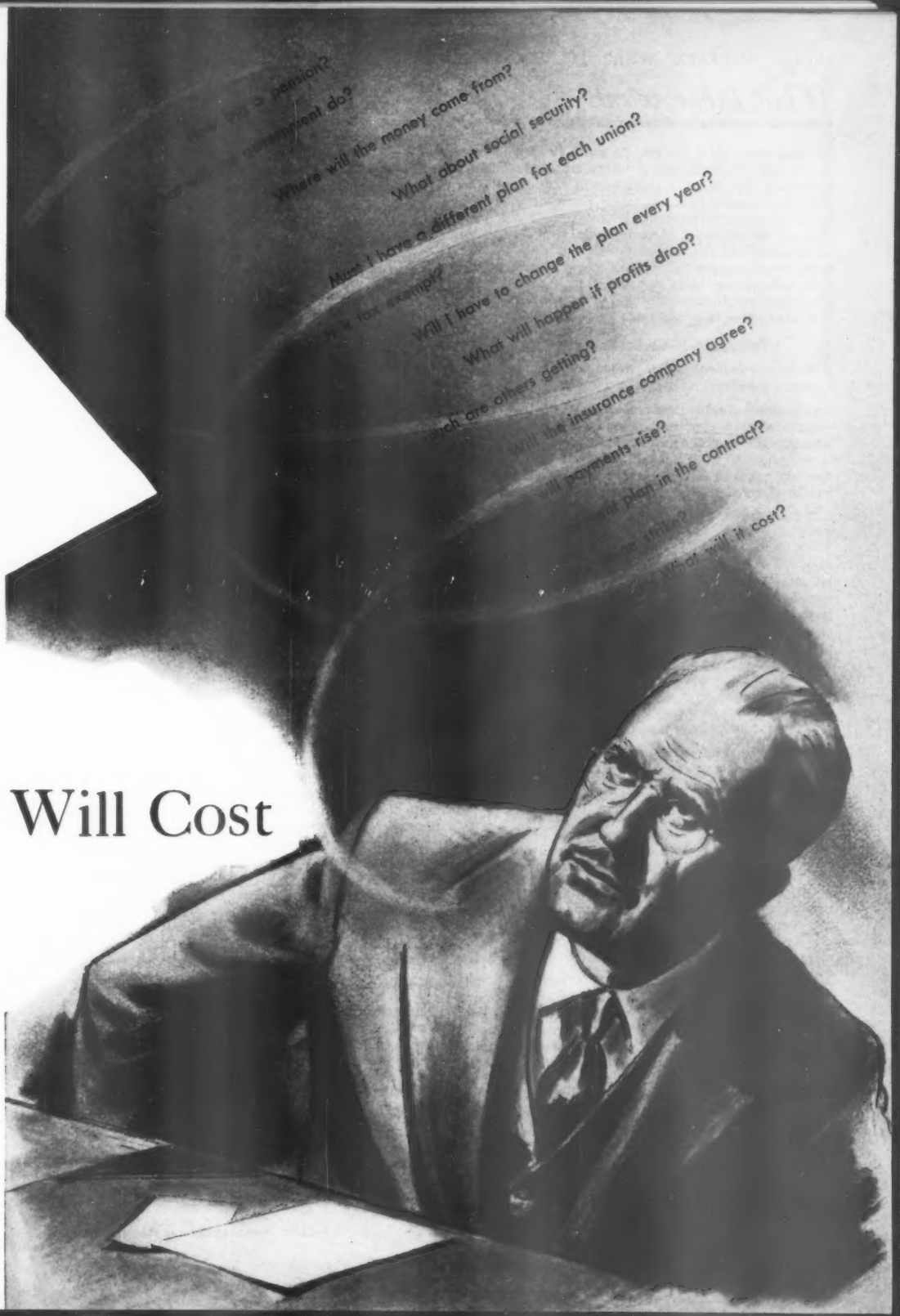
The second attack—*on management at the bargaining table*—will come with the big contract negotiations starting in the next 90 days. Its objective will be to supplement and build upon the "basic minimums" provided by government.

Will the government "minimums" be more or less than adequate? On the answer will depend the attitude of managements that wish to provide employees with reasonable—and calculable—security and benefits. But the political atmosphere in which government benefits will be determined make it difficult to predict the size of the benefits even in 1949, and virtually *impossible* to forecast the nature of the program five or ten years from now.

And what will the government program cost? On the answer to that will depend the size of the *commitments* management can make with any hope of fulfilling them. Yet there *is* no answer. The cost of welfare programs spirals upward with the passage of years—even if the amount of the benefits to an individual remains fixed.

Faced with such uncertainties—and faced with the sure knowledge that welfare is a long-term business—even the best-intentioned and most sincerely motivated employer will be hesitant to agree to labor's welfare demands. To many employers it looks like a case of labor's demanding that a lot of new unknowns be piled on top of a lot of old ones.

Continued on page 68


Will Cost
Where will the money come from?
What about social security?
Must I have a different plan for each union?
Will I have to change the plan every year?
What will happen if profits drop?
Will the insurance company agree?
Will payments rise?
What will it cost?

What labor wants

Labor wants all it can get. As usual, it wants more in the pay envelope, and it wants more and better social security. What is significant is the aggressive shift in emphasis that has taken place—*from take-home pay to social security.*

Labor wants social security from two sources—government and management. What it fails to get from one, it may get from the other. If successful with both, in any large measure, it will have found a bonanza, a welfare jackpot that will make its earlier rounds of wage increases seem small by comparison.

Cradle-to-Grave Security

From government, labor wants a cradle-to-grave program, supported by payroll taxes:

1. National health insurance. Covering an estimated 125,000,000 persons, this tremendous undertaking would literally provide for every health need from before birth till death. Medical, dental, and hospital care and related services would be provided free of charge for every member of the family.

2. Liberalized old-age and survivors' insurance. First step would be extension of coverage to some 25,000,000 persons not now covered. Second step—even more important—would be liberalization of benefits. The maximum wage on which benefits are computed would go up from $3000 to $4800. The formula for computing benefits would also go up, allowing 50 per cent of the first $75 of average wages, plus 15 per cent of additional earnings. This is a big jump over the present 40 per cent of the first $50 and 10 per cent of wages beyond this. Further, women could retire at age 60 (instead of the present 65), and retired workers could earn up to $50 monthly without loss of insurance (instead of present $15).

3. Liberalized unemployment insurance. Again the first proposed step would be extension of coverage to groups now exempt. Second step would be to raise benefits to a top of $30 a week, with a sliding scale up to $45 a week for workers with dependents. Uniform duration of 26 weeks a year would be required in all states, and workers could refuse jobs not utilitizing their highest skill without penalty.

4. Disability insurance. This would supplement unemployment insurance which does not cover disability. Benefits of two types would be provided: for short periods (up to 26 weeks), same as unemployment insurance; for longer periods (over 26 weeks), same as old-age and survivors' insurance.

These are no idle hopes. Favored by the present administration, the cradle-to-grave program will be pushed hard. Proposals will undoubtedly be toned down; some are likely to be rejected outright this year. Best candidate for rejection is the national health plan, but even this is not certain. One thing is sure: what Congress does not make law this year will be pressed again next year, and the year after.

Private Welfare Plans

From management, labor wants very much the same general pattern of welfare benefits that it is pressing government to give. It wants to tailor the pattern, however, to fit individual firms and groups of workers. Standard approach will be *that private plans are essential to build upon and supplement whatever government does; that government benefits are merely statutory minimums.*

Details of bargaining demands will vary, but this is the general pattern to expect:

1. Pensions. Substantial retirement benefits will be asked. The $100 a month won by Lewis for the coal miners is likely to set the demand pattern. The United Auto Workers are talking in these terms, and the Steelworkers may ask for $150 a month.

2. Life insurance. Benefit amounts will vary widely, but death payment demands are an integral part of welfare goals.

3. Disability insurance. Based on the same reasoning as government proposals, insurance would provide for automatic sick leave and sickness pay.

4. Hospitalization. Payment of all expenses incurred by worker or family while hospitalized will be demanded.

5. Medical and surgical insurance. Coverage will be demanded to supplement hospitalization plans, will include the worker's family.

Finally, labor will demand compulsory bargaining on welfare plans.

In support of this demand, labor will cite the fact that by mid-1948 more than 3,000,000 workers were already covered by some type of negotiated health, welfare, or retirement plan. Following this up, labor will ask, in effect:

"Why is management concerned at the extension of a principle already accepted in contracts covering 20 per cent of all union workers?"

The question requires an answer, and the answer is just this: All management would be forced to bargain on welfare plans, *irrespective of the economic feasibility of doing so in individual cases.*

But the hard fact is that labor is already well on the way toward having this demand fulfilled by the courts. The Supreme Court has still to act, but the Circuit Court of Appeals has upheld the NLRB contention that pensions and retirement plans are part of wages and conditions of employment, and that management therefore must bargain on them. The "probable" Supreme Court decision gives labor a big stick. Labor will wield it freely in its 1949 bargaining.

What the bargaining problems are

Bargaining over welfare plans—especially pensions—promises plenty of headaches. Far more complex than wage negotiations, job evaluation, and the like, welfare bargaining is a job for experts. And chances are good that even the experts are going to be stumped by some of the problems that crop up:

1. Negotiation. Besides bargaining with labor over welfare, employers must also negotiate with insurance carriers, state insurance officials, and the Bureau of Internal Revenue. In addition to technical and actuarial problems involved for each plant, a mass of laws and regulations must be considered at each

UNSOUND PENSION PLANS SPELL TROUBLE for employees and unions as well as for employers. Here is why:

They bring tragedy and disillusionment to employees if promised benefits cannot be paid because available funds are inadequate.

They jeopardize the union's existence by leaving it open to members' charges of short-sightedness and incompetence if the plan should fail.

They jeopardize the company's existence by forcing it to undertake long-term fixed obligations so large they might bring bankruptcy.

Unions and employers alike have a responsibility to protect employees —and themselves—against the consequences of unsound pension plans.

step of the bargaining process. On these grounds alone, many employers are convinced that negotiations will bog down.

Although their problems will be numerous and complex, firms with no existing welfare plans will at least be starting off with a clean slate. In a much tougher spot will be those employers who have maintained welfare plans for years on a unilateral basis. Here unions feel they will be shooting at sitting ducks because it will be so easy to force these plans into labor agreements. In process, strong pressure will be exerted to improve such plans, liberalize benefits, and otherwise broaden the welfare base.

In the tightest spot of all will be the many employers who bargain with several unions. In such cases, unions typically compete to come up with the best settlements. Thus the most likely result is several different plans with different benefits—a costly and economically unsound arrangement. To negotiate and live with such a hodge-podge is a nightmare. However, to try to bring all unions together for agreement on a uniform plan would put management squarely in the middle. No negotiator can represent management adequately while dividing his time between mediation and bargaining.

2. Administration. Once a plan is negotiated and installed, more headaches loom up. *As part of the labor agreement, welfare plans will be subject to grievance and arbitration clauses unless special provisions are made to prevent this.* Such preventive measures are essential to avoid innumerable complications. For example, arbitration awards may be unenforceable on the insurance carrier—or unacceptable to state insurance officials or the federal Bureau of Internal Revenue. If special administrative boards are called for, similar problems are inevitable, plus the prospect of strife over who shall have majority control.

3. Renegotiation. The most discouraging element in the entire picture is the prospect of annual reopening of welfare plans for negotiation. Troublesome enough in case of life insurance, hospitalization, and the like, the problem reaches most acute proportions in the case of pension plans. Programs carefully set up for 10, 20, and 30 years in the future are not simply or cheaply revised. Yet at least one major labor leader has specifically gone on record that his present pension proposals are merely a "first step"—to be followed by annual drives for improvement. Every realistic management must face this same prospect.

Problems of negotiating, administering, and renegotiating welfare plans are general, will be faced by all employers, and will be troublesome to all. There are lots of other problems that may plague management in individual cases, depending on local conditions. Here are a few examples, illustrative but by no means all-inclusive:

1. Union security. Many union welfare proposals are, in effect, unofficial closed shops. Managements with lesser degrees of security in their agreements will find such proposals real problems. Plans restricted to union members or to members "in good standing" tend to undermine fundamental welfare objectives through introduction of unrelated but important bargaining issues. Further, the unit appropriate for bargaining is not necessarily the best unit for sound and economical welfare coverage.

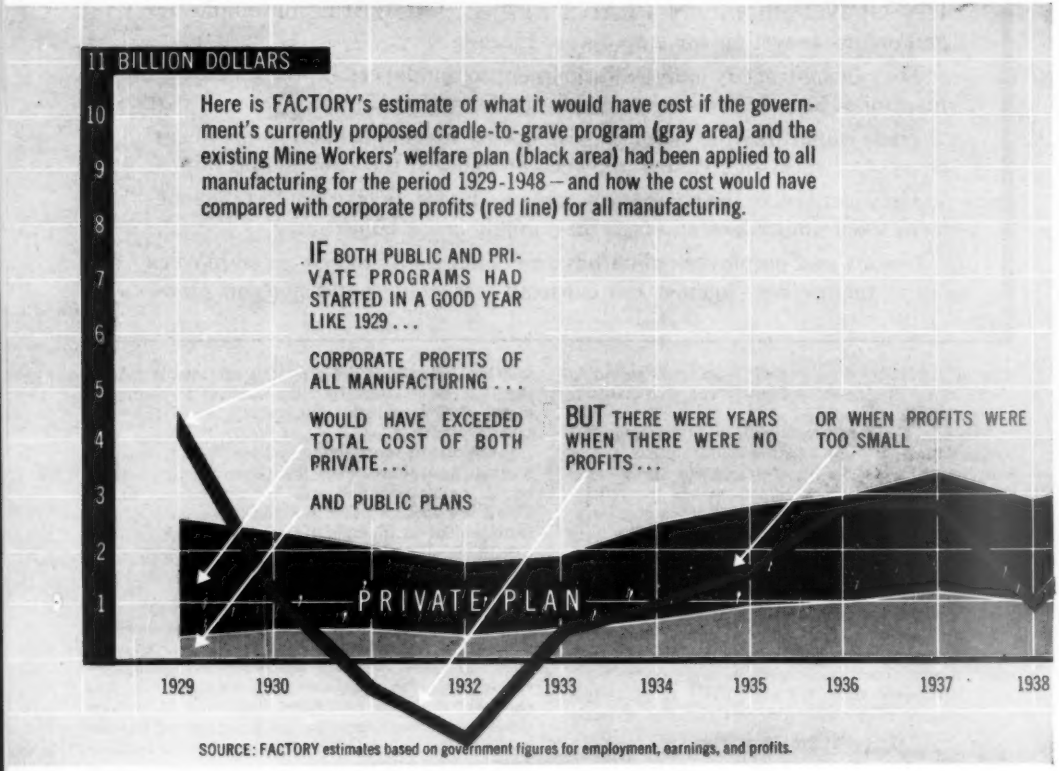
2. Inflexibility. Rigidity of costs is already one of management's big problems. Negotiated welfare plans set up one additional area where employers are largely without necessary managerial control. Added to others such as the basic wage scale and production standards (in many cases), all key payroll costs threaten to become tied up.

3. Unsound union demands. Limited only by human ingenuity, the variety of specific demands can be counted on to range all over the lot. Many "fund" proposals will undoubtedly be actuarially unsound, but these usually appear simpler and will therefore have tremendous rank-and-file appeal. Likewise, union committees will often hold out for excessive amounts of benefits, without recognition of the long-term problems associated with funding, setting up of adequate reserves, and adjusting plans to meet changing business conditions.

4. Strikes. Employers who count on traditional union difficulties in stirring up strike excitement over welfare issues may be due for a rude awakening this year in industries where prosperity is high. There is little reason to doubt labor's pronouncements to date that it is determined to "win with welfare in 1949."

Continued on page 70

COST OF WELFARE—PUBLIC AND PRIVATE—


11 BILLION DOLLARS
10
9
8
7
6
5
4
3
2
1
Here is FACTORY's estimate of what it would have cost if the government's currently proposed cradle-to-grave program (gray area) and the existing Mine Workers' welfare plan (black area) had been applied to all manufacturing for the period 1929-1948—and how the cost would have compared with corporate profits (red line) for all manufacturing.
IF BOTH PUBLIC AND PRIVATE PROGRAMS HAD STARTED IN A GOOD YEAR LIKE 1929 . . .
CORPORATE PROFITS OF ALL MANUFACTURING . . .
WOULD HAVE EXCEEDED TOTAL COST OF BOTH PRIVATE . . .
AND PUBLIC PLANS
BUT THERE WERE YEARS WHEN THERE WERE NO PROFITS . . .
OR WHEN PROFITS WERE TOO SMALL
PRIVATE PLAN
1929
1930
1932
1933
1934
1935
1936
1937
1938

SOURCE: FACTORY estimates based on government figures for employment, earnings, and profits.

What welfare will cost

More cost-conscious than ever as inflation eases off, employers are touchy about the price they must pay for welfare. They want to know: (1) How much of a burden would current proposals and demands put on the economy as a whole; and (2) specifically, what would the cost be per employee, per hour, and per year.

These are big questions. Answers must be general and based on estimates, but can be partly refined at the local plant level. Here are figures designed to give some indication of costs if government and private programs were adopted this year:

1. Cost of federal cradle-to-grave program. First-year cost is estimated at 3.5 per cent of payroll, fifth-year cost at 11 per cent and long-term cost (1990) at 18 per cent. Some idea of the dollar meaning of these figures is conveyed by estimates that by 1955 cost could be in the neighborhood of $12 billion (at 11 per cent tax).

If percentages were to work out as estimated, cost per employee would be something like this: In 1950, at 3½ per cent tax, the cost for a worker who earned $1500 would be $52.50. In 1955, at 11 per cent tax, the cost would be $165, in 1990, $270. Similarly, for a worker with a $3000 income the cost would be $105 in 1950, $330 in 1955, and $540 in 1990.

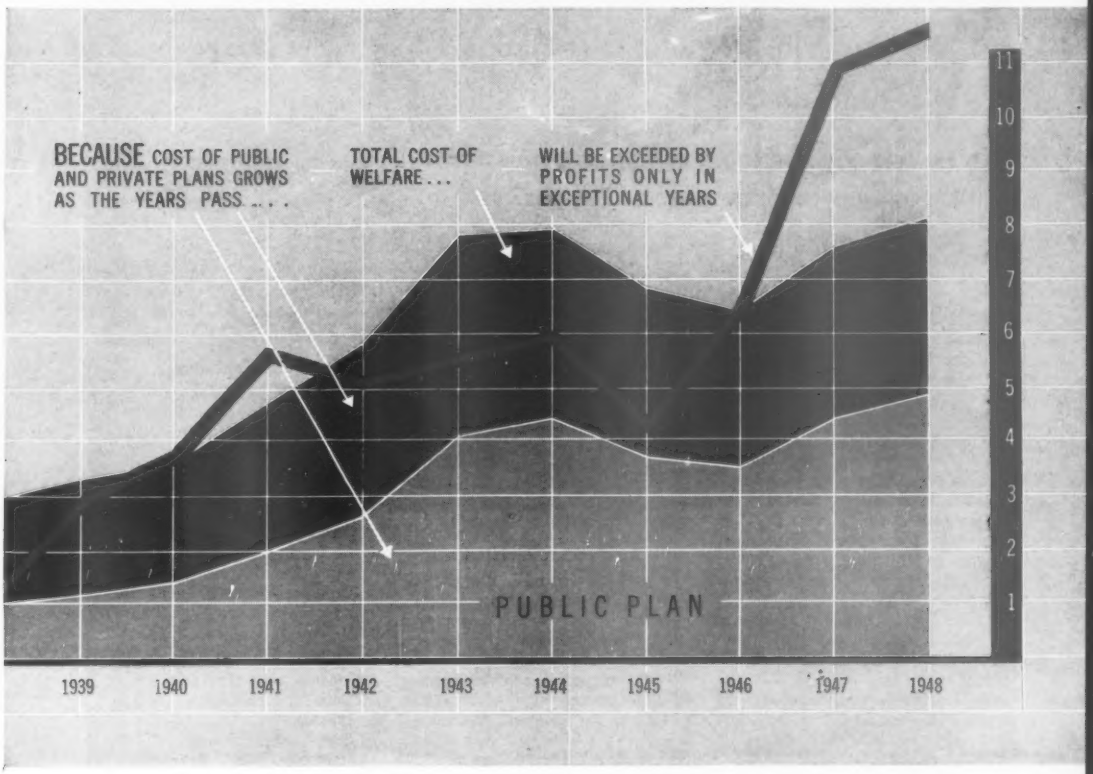
At present income and employment levels, cost by 1955 would be an estimated $6 billion. That is three times profits in 1936, and greater than profits in any year from 1931 to 1940. If income and employment should fall, costs would go up at the same time profits were tobogganing downward.

Biggest lesson for management in these estimates on cost of government cradle-to-grave welfare program is this:

Welfare is long-term business. Costs skyrocket with passage of time—may lead to disaster if planning is not well-nigh perfect.

2. Cost of private welfare plans. Private plans vary widely. Like all business ventures, investors in welfare get what they pay for—and what they pay will shock the uninitiated. To illustrate, assume that the celebrated $100-per-month pension plan negotiated by Lewis for the coal miners were to be applied today to an estimated 15,000,000 wage and salary earners in the manufacturing industry. In

AND HOW IT COMPARES WITH PROFITS



1948 the mine owners contributed approximately $250 for each miner into the welfare fund, amounting to about 12.5 cents per hour. *Extended to all manufacturing, this would add up to the gigantic sum of $3.75 billion a year for the first few years.* Most significant to employers is the critical fact that actuarial experts have condemned the Lewis plan as *unsound*, predict disaster as the years roll on and the volume of retirements shoots up. The only conclusion is that $3.75 billion wouldn't be big enough for manufacturing as a whole, if the miners' plan were accepted as a standard.

But should the miners' plan be accepted as a standard? Does it, perhaps, provide benefits greater than would be considered appropriate for manufacturing? Not if the demands of the United Steelworkers and United Auto Workers are any indication of what unions in general will go after. Murray's Steelworkers are aiming for pensions of $150 a month, plus $5400 group life insurance, $1500 paid-up life insurance at age 65, hospitalization pay of $8 per day up to one year for employees and family, $35-a-week sick benefits, and surgical expenses up to $225 a year for employees and family. Obviously, what is asked and what is granted are two different matters. *But*—initial demands are getting bigger—and costlier.

Where the money comes from

Labor does not accept arguments that more welfare means less take-home pay, that employees themselves must pay for benefits.

Unions have argued for years that they want a bigger share of the national income. Their solution: *pay welfare costs out of profits.* This is an old story. It sounds good in good years, not so good in lean years. For example, what about years when profits are less than welfare costs—or years when there are actually deficits? Since 1929 there have been many such years. More than any other fact, this points up the fallacy of the "take it out of profits" argument advanced by many union leaders who ought to know it can't be done that way.

Bitter medicine though it may be, welfare must come out of the pay envelope to be on sound economic ground. *If money is available for payment of benefits, it is also available to be put in the pay envelope.*

But labor need not be discouraged. As it well knows, there is a clear path to a bigger share of national income through greater productivity.

How We Handle 50% More Output With 25% Less Manpower

New equipment, and more equipment, plus a reorganized handling set-up has resulted in an over-all increase of 108 per cent in per-man handling efficiency

JAMES R. KIRTS • MANAGER, SCHEDULING AND MATERIAL HANDLING SERVEL, INC., EVANSVILLE, IND.

AN EXHAUSTIVE STUDY of materials handling methods and requirements was begun at Servel three years ago. Today, with total production up by 50 per cent, the total materials handling crew has been reduced from 204 to 146. On a per-man basis, that represents an increase in handling efficiency of 108 per cent.

Our total plant area is more than 70 acres, of which more than 2,000,000 square feet of floor space is under roof. Lacing in and out of machines, storage, and equipment are five miles of aisles through which the material for production must pass.

We handle more than 100,000 tons of material per year. This is handled on an average of three times for each type of material. The study showed that a complete system of mechanical handling for this intermittent load was essential. Through the use of small tractors, electric trucks, and motor scooters, we have been able to save materially in dollars and cents, time, floor space, and manpower.

When the problem of improving materials handling was undertaken, three facts stood out:

1. A reduction of hand loading and stacking had to be one of the first considerations. (Previous methods had required the use of many pairs of hands and an excessive amount of floor space due to the limitations in manual stacking of bulky or weighty materials.)

2. Long distances were involved.

3. More efficient scheduling and follow-up were necessary to keep an even flow of materials from stockrooms to production.

Augmenting our fleet of handling equipment to the point where it comprised 29 pieces of the general types illustrated was an important step. However, equipment alone was not the whole answer to the materials handling problem. Proper organization of the job was another important factor, and this was undertaken immediately with an eye on utilization of personnel to achieve the best possible results.

Roving Supervision

To keeping materials flowing on schedule, one of the most experienced drivers was selected as group leader and was put on a roving supervisory assignment in which he was made responsible for the trucks and their operations.

To carry out his work, the group leader covers the plant on a scooter, directing the activities of the drivers who work under him. He checks with the receiving department as to when and where railroad cars of material will arrive. He then assigns the proper equipment and men to unload this material, and is on hand to supervise unloading and storage of the incoming materials. By checking with his men on location in the plant, rather than from a stationary office, he is able to cut down lost time of drivers waiting for new assignment. In this capacity he keeps track of "material move calls" and supervises driver activity to make sure that such materials are moved to proper production locations on schedule.

In addition to his other assignments the roving group leader is responsible for maintenance and repair of his equipment. He checks each piece of equipment daily and issues orders for necessary repairs. Field supervision of this nature has reduced the margin for error which occurred in times past when the drivers, in many cases, had to act on their own initiative because no field supervision was available for them.

Job Training

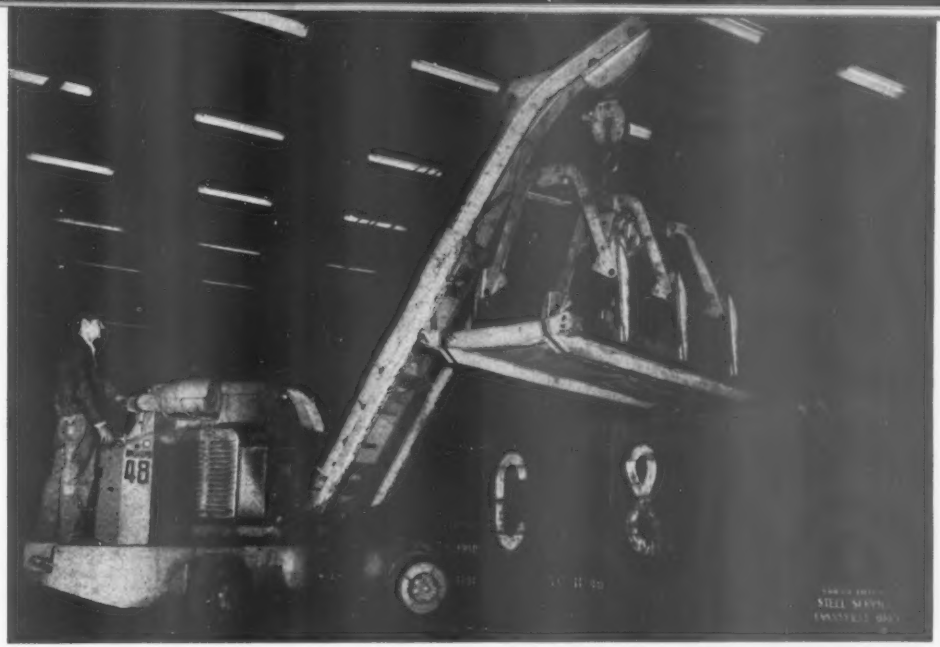
While to a large degree it is the responsibility of the roving group leader to assign the right truck for the right job, a program of job training has been undertaken among the drivers to give them judgment, too, in deciding the correct answer to the question, "What is the right truck for the job assigned?" The fleet of trucks ranges in capacity from 2000 to 10,000 pounds, and includes:

- 7 4000-lb. platform trucks
- 1 6000-lb. platform truck
- 5 4000-lb. fork trucks
- 3 6000-lb. fork trucks
- 2 2000-lb. fork trucks
- 1 2000-lb. fork truck
- 2 10,000-lb. fork trucks
- 4 tractors
- 1 10,000-lb. crane-type truck
- 2 package car scooters (to move small parts on long runs)
- 1 scooter (used by group leader to provide supervision)

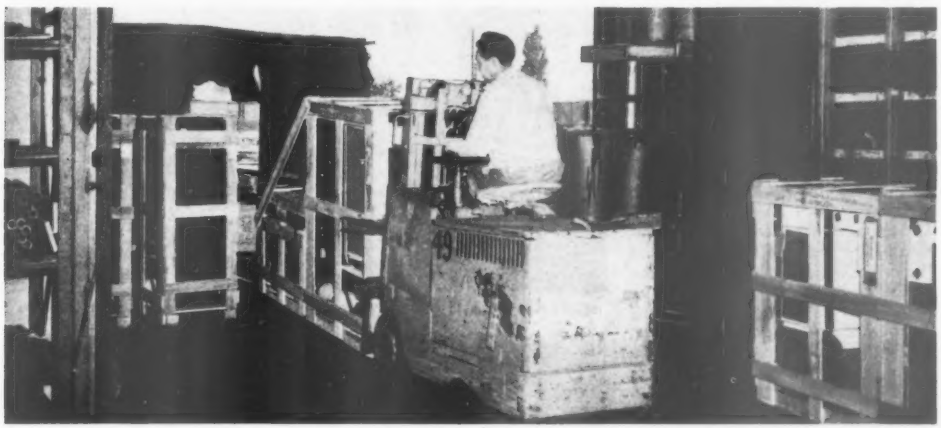
Dispatching

The handling study made it apparent that the plant area had grown to such an extent that a full-time dispatcher was necessary. Experience had shown that not only is the dispatcher essential, but her work saves a great deal of time in properly routing drivers on their calls.

One of the company's scooter drivers was chosen for this position because of her knowledge of plant layout and personnel. The dispatcher takes all "move orders" by phone. She keeps a record of type of material, where it is to be picked up, and its destination. With this information, she is able to determine what type of equipment is needed and to advise the person re-



CRANE TRUCK WITH ADJUSTABLE CRADLE MAKES QUICK WORK OF PICKING UP 10,000 POUNDS OF SHEET STEEL



FORK-LIFT TRUCK WITH 2000-LB. CAPACITY MOVES LOAD OF CRATED AIR CONDITIONING UNITS DIRECTLY TO VAN

TRACTOR WITH QUICK-COUPLING TRAILER MOVES 5000 POUNDS OF EVAPORATORS FROM STORAGE TO ASSEMBLY LINE

questing service when he may expect the driver to report to him. A specific piece of equipment is then assigned to the particular job. Checks on the dispatching system have proved that this plan eliminates much "deadheading" on return trips.

The work of the dispatcher is primarily tied in with intermittent orders for handling of materials. Some units of the fleet, however, operate on a regular schedule, picking up production parts and moving them to the next department for further processing.

In the plant there are six pick-up areas, and in each case, as the inspector finishes his work on the parts, he places a "move order" in the full container. On this he specifies part number, quantity, location, and destination. These containers are picked up regularly to prevent congestion in the area and to keep the next department supplied with material. It is also the responsibility of the drivers on these regular routes to keep each of the departments supplied with empty containers.

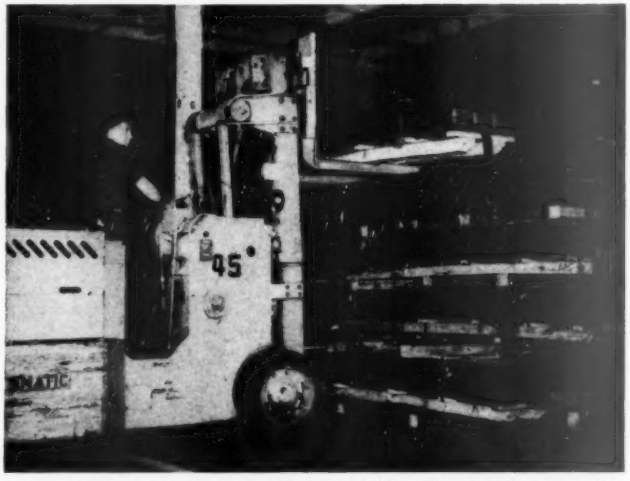
What Has Been Accomplished

A statistical dollar-and-cents review of the materials handling problem is not available in a manner which would allow direct comparison of costs before and after the reorganization. There are, however, several exact comparisons which can be made to show the progress which has been effected. At the time we attacked the problem there were 54 truck operators who were assisted by 154 loaders, unloaders, and stackers. In the three years which have passed, improvements in method of loading, stacking and general operation have reduced this force to 33 truck operators and 113 material handlers.

At the same time that this reduction was taking place, the amount of work handled by the group was on the upswing. Production of household refrigeration increased by 20 per cent; production of electric refrigeration equipment by 100 per cent; and two entirely new products, the Servel air conditioner and gas water heater, were placed in production.

No small point is the fact that performance in stores and the truck service departments for 1948 shows a substantial reduction in actual expense when compared with the budget established late in 1947.

FORK-LIFT TRUCK PICKS UP CRATES FROM VAN FOR MOVE TO STORAGE AREA



HEAVY-DUTY FORK-LIFT TRUCK STACKS UP TO 10,000 POUNDS OF SHEET STEEL

SCOOTER FOR GROUP LEADER MEANS "ON THE SPOT" HANDLING SUPERVISION

MODEL of refinery unit, built for $50 from plywood and scrap, did a big training job. Operators remove all parts and reconstruct to learn unit's functions. Instructor is saved lengthy explanation on the job

Using Model to Teach Process

WILLIAM B. HALLADAY • TRAINING REPRESENTATIVE, THE ATLANTIC REFINING COMPANY, PHILADELPHIA, PA.

AT THE ATLANTIC REFINING COMPANY we frequently face the problem of training operators for new refinery units. Recently, when the lubricating department set up a new MEK solvent dewaxing unit, we wanted to start operation of the unit as soon as it was completed. This meant training its operators well in advance. To help us do the job, we gambled $50 and built a model of the unit.

The model, shown above, was intended to be used in teaching trainees the theory and flow of the process. They had to become familiar with the functions of each major installation on the unit.

In a relatively short period, trainees learned a great deal from the model. It more than served its purpose. The foreman-instructor was saved countless words of explanation by having something tangible for a training aid. He pointed out and explained parts and their functions on the model. As a result of this success, several more models have been built and used with great savings in cost and time.

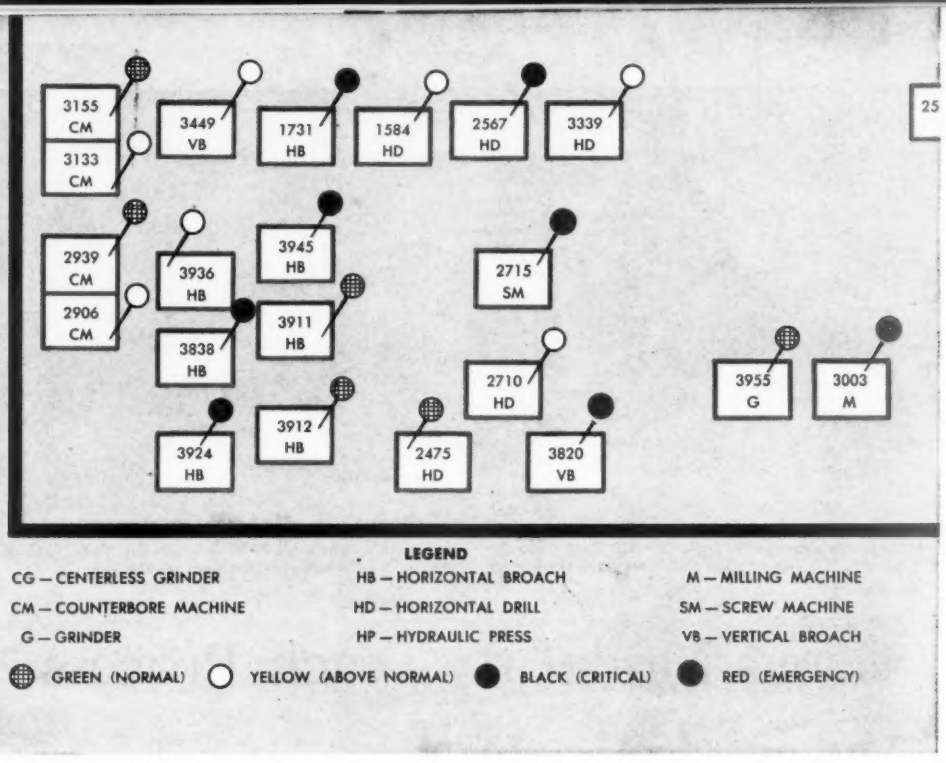
Wooden models resembling the actual installations were turned out in contour form at the pattern shop. Separate ¾-in. plywood bases were constructed to hold the two divisions of the unit. Dowels were glued to the base of each model, and holes were drilled in the bases to receive the dowels. The name and number of the actual piece of equipment was typed on gummed paper and pasted on each model.

No. 14 electric wire (cotton wound) was bent to simulate the required piping, and models were painted in color, following the standard color list of refinery equipment. Lines were painted as realistically as possible and still leave them readily traceable. A legend of line colors was placed on the model to make the flow almost self-explanatory.

The instructor referred directly to the model when describing the theory of operation to the trainees. To help operators understand various steps in the process, each piece of equipment was explained in detail. In tracing flow, the instructor removed sections of the piping and actually built up the flow from section to section. Product lines, reflux, and recycle lines were removed and built up independently to illustrate operation.

After operators had been taught theory and operation, each man was required to knock down and rebuild the model, thereby learning flow from unit to unit. They were also taught to relate model lines to blueprints and flow diagrams of the actual plant. This was a help to those operators who did not readily read blueprints. Many of the pipelines shown on the model are buried underground on the actual unit, so they cannot be so readily traced in the field. As modifications or major changes were made on the actual unit, they were easily duplicated and explained on the model.

The model was not built to scale, nor does it resemble the physical appearance of the actual plant. It was designed only to familiarize the operator with the unit. Plant layout in this instance was not considered of primary importance to the operators. As a result of using the model in training, we know that some know-how and know-why can come only from experience, but a considerable amount can be acquired by adequate explanation during the training period of the employee.



WALL CHARTS show location of every oil-hydraulic unit in the plant. One is provided for oilers, another for repairmen. Map pins of different colors are used to indicate the condition of every machine

Visual Control Board Spurs

Repairman can see where trouble is, and how quickly repairs are needed. Results—less downtime, elimination of paperwork, lower maintenance costs

P. J. EYTALIS • EXPERIMENTAL ENGINEER, MECHANICS UNIVERSAL JOINT DIV., BORG-WARNER CORPORATION, ROCKFORD, ILL.

SUBSTITUTION OF visual control pinboards for inaccessible box files of service record cards has been a real boon to the maintenance department at Mechanics.

In a single application, aimed at expediting repairs of oil-hydraulic production units that develop oil leaks, the new system has resulted in a 50 per cent reduction of downtime from this cause, and has cut consumption of hydraulic oil by better than 25 per cent. The cost of maintenance has been lowered, too, by the elimination of paperwork.

Everyone in the department can tell at a glance just what the condition is of any of the 140-odd units serviced. Formerly, it was necessary to refer to the individual cards tucked away in the file box on the lubrication engineer's desk. The new control boards, prominently located on the wall of the engineer's office, have changed all this.

Old Method. Each hydraulic unit (over 140 units) had a service and oil consumption card. They were filed in a box drawer by departments.

Each day the lubrication engineer selected groups of cards and assigned them to the oilers. It was the oilers' responsibility to check each assigned unit for oil consumption and make proper entries on each card. Whenever excessive oil consumption was found, oilers made out special notices for the lubrication engineer.

These special notices were reviewed by the lubrication engineer prior to referring them to a repairman for prompt correction. Often the notices were misplaced before assignment or lost afterward by the repairman. Consequently the repairs were not made as promptly as they should have been, or not at all. As a result, oil was being needlessly wasted.

On their next survey oilers would

SERVICE TRUCK, which can be pushed right to the job, contains all tools, blueprint instructions, and gages that the repairman is likely to need in order to make quick and efficient repairs to the machine

Machine Repairs

find defective units unrepaired. There followed another special notice to the lubrication engineer, this time with a personal discussion to emphasize the need. Oilers were requested to check with repairmen, who frankly did not like the burden of proof that went with it. Useless petty arguments as to responsibility arose between these groups, which were not conducive to good morale.

New Method. Two identical control boards, each 4 feet wide by 8 feet high, were hung on the office wall. One board is for the oilers, the other for the repairmen.

Each board bears a large-scale, black-and-white layout of the entire plant. Departmental boundaries are shown in heavy lines, and departments are identified by name. A standard red-bordered rectangular label has been glued on the layout in the approximate position of each oil-hydraulic unit. Each label is marked with machine name and number.

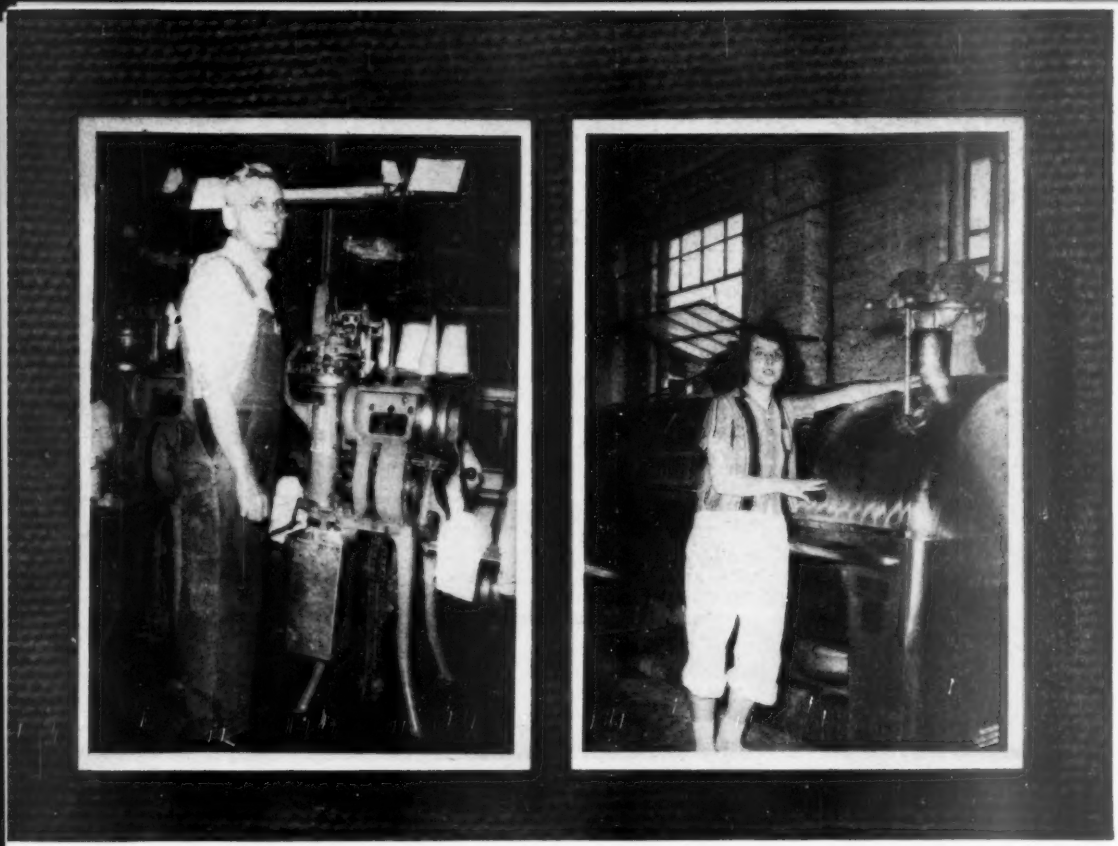
Four differently colored map pins are used to indicate the condition of each unit, according to oil consumption, as follows: green, normal; yellow, above normal; black, critical; and red, emergency. Spare pins are kept handy in small boxes at the bottom of each chart.

Oilers have a routine schedule to follow in making their surveys of hydraulic equipment. Daily after each survey the oilers place a pin of the proper color in the tag on their control board for each machine checked that day.

Repairmen are responsible for placing all the black and red pins on their own board that newly appear on the oilers' board. Neither group is permitted to manipulate the other's board. It is the repairmen's job to see that the black and red pins do not stay long on the oilers' board. The lubrication engineer sees to it that repairmen get these pins off their own board as quickly as possible. As repairs are made, the repairmen can change their own board, but not the oilers'. Oilers change their board after the next survey—daily, in many cases.

Results. When the pin-boards were first installed they were heavily speckled with black and red pins. No one realized under the old card system that so many units were in need of repair. Repairmen suddenly got an over-all picture of actual conditions they never had before.

Formerly every repair order was considered an emergency order, and no intelligent scheduling of repairs was possible. Repairmen never felt they could get out from under the load. Now they have something to shoot at. First things now come first, consequently better repair jobs are done and oil-hydraulic equipment is kept in good operating condition all the time.



WHAT'S THE JOB LIKE? APPLICANTS USUALLY WANT TO KNOW. PHOTOGRAPHS LIKE THESE TELL THE STORY

How Job Photographs Help Me

RALPH P. KREUTER • DIRECTOR, INDUSTRIAL RELATIONS, HAND KNIT HOSIERY COMPANY, SHEBOYGAN, WIS.

A PICTURE IS WORTH ten thousand words. I have found this old, old saw especially true in placement work. We have some 50 or 60 different jobs at Hand Knit Hosiery and most of them have names that don't help much in making the nature of the jobs clear to applicants coming in for the first time.

"What's looping?"

"What's box drying—and raveling—and transfer knitting? And what do you mean by pairing?"

People today not only ask, "What does it pay?" but also, "What kind of job is it?" The time has gone when such questions would be met with a snarled, "Do you want a job or don't you?"

People *do* have job preferences. Both theory and experience have checked as correct the conclusion that people will do best the jobs they like best.

Will too many people pick the same job? No! People don't want the same kind of job any more than they want the same kind of homes or husbands or wives. Or the same kind of neckties and hats. And, too, if there is a wage differential between the jobs—that is, one that has been set in accordance with sound principles of job evaluation—you'll find that the highest paid jobs won't always be chosen.

In answer to an applicant's inquiry, I have tried more than once to explain our jobs with words and gestures. Then I took several applicants into our mill to look at various jobs. This helped, but it had obvious drawbacks. It took my time and the applicant's time, and it caused a couple of hundred busy pepole to look up and wonder.

So here is what I did, and anyone can do at least as well. I had my camera fitted with a $10 attachment for flashlight pictures. I have been told that a box camera can be so fitted. I standardized on a distance of three long paces (about 10 feet), a time of 1/50 of a second, a light opening of 1/3 of

(LEFT TO RIGHT) KNITTING, WASHING AND SHRINKPROOFING, LOOPING

When I Hire People

the distance from 16 to 32, and a midget flashbulb. I enlarge to 5x7.

The project started out with the simple thought of saving a little time and doing better at explaining the job characteristics to applicants. It ended up with more angles than anyone would suspect. Here are a few of them:

"What shall I wear?" Job pictures in the personnel director's office tell the story better than he can and save time.

Perhaps first impressions should not count for so much, but they frequently do. Very often the first impression a newcomer gets of his immediate boss is on his first work day, and sometimes it's the foreman's bad day. I have found it handy, when discussing jobs with an applicant, to reach into a rack and pull out a picture of the foreman and say:

"Here is the foreman in that department. He'll be friendly and helpful to you, and train you well for the job."

Women applicants have told me more than once that they would take any kind of job except a machine job. Their husbands or brothers or mothers had told them stories of lost fingers and such. A picture or two of a smiling woman removing socks from a knitting machine or operating a looping machine usually changes these ideas. I also have a picture of a charming housewife operating a washing machine—few men object to that. Our machines are just as safe. Pictures help to prove it.

Junky workplaces don't help much in selling jobs, and it doesn't take much to make a workplace look junky. The trouble is, when you see it every day you don't realize it. But take a picture of it! Scraps of paper on the floor show up; so does that mess of junk in the corner. In our industry lint and fuzz collect in front of fans and humidifiers, and that, in turn, collects dirt and grease. A picture shows this, and it also shows that lopsided chair Susie-Ann has been complaining about for the past year or so. The picture tells a better story than Susie did.

A Case in Point

Here is one that came up. Little Margie is her mother's pride and joy. She "took" commercial subjects for four years at high school. No factory job for her! Not if her mother has anything to say about it. No, sir!

Margie definitely does not agree. It happens that you have done a very good job of selling her on being a looper. Her finger dexterity skill is very high and her eyesight is far better than average. On the other hand, she never liked the commercial work, and her test scores in that field indicate little promise of success.

The girl is not a baby, but mother is mother. So we take a flash photo or two of the happiest loopers, one of the department, and a shot of our smiling supervisor. Margie takes them home with her and works on her mother. The story won't always have a happy ending, of course, but the odds are good. Pictures don't cost nearly as much as misfits or vacant looping places.

We lose many of our girls to Dan Cupid, but frequently they are willing to come back for a short time if we get into a production jam and can find no one else with enough experience to serve the purpose. One such girl posed for a picture, but finished up and went back to her housework before it was developed. Upon hearing from one of her employee-friends that the picture "turned out swell," she asked for a copy. I sent her a 5x7 enlargement in a simple frame and endorsed it, "Thanks a lot for helping us out."

Her husband, who formerly objected to her helping out, objects no longer. The picture shows her happy at work at an interesting and dignified job.

Using Better Layouts as a Tool to Reduce Costs

Templet-type master layouts provide answers for this plant's layout department—which has also devised a convenient way to store its tools

C. E. PASS • CENTRAL PLANT LAYOUT SUPERVISOR, MARATHON CORPORATION, MENASHA, WISC.

A WELL-PLANNED, over-all plant layout program is paying handsome dividends to Marathon. Here are some of the benefits being realized:

1. Reduced manufacturing costs through straight-line production flow.

2. Reduction in amount of work-in-process.

3. Conservation of floor space.

4. Improved handling.

5. Elimination of unnecessary machine moves.

6. A better long-range planning job, with the assurance of conformity to the pattern for expansion.

7. Improved employee relations, as a result of more efficient operation, orderly surroundings, and improved working conditions.

To assure maximum realization of these benefits, the broadest possible responsibility and authority has been assigned to the Marathon layout department. Specifically, the layout department is charged with these functions:

1. To design and maintain plant layouts for all areas of manufacturing or processing.

2. To prepare and maintain complete files of plant layout flow data for all manufacturing processes.

3. To analyze the plant layout and propose changes which will (a) provide the best combination of conditions for availability of supply outlets; (b) provide the best accommodations for current and anticipated equipment and material; and (c) give the worker a comfortable and desirable place to work.

4. To prepare machine layouts and preliminary building characteristics and dimensions for anticipated facility expansion.

5. To direct and approve layout changes proposed by members of management and other operating personnel.

How the Department Operates

Key point in the layout department is the 4x11-ft. floor cabinet in which are stored master layouts of every floor of every building in the five-plant Marathon operation. The cabinet is divided into four compartments and allows for flat storage in guide slots of 56 plywood-mounted templet layouts. Each layout section and slot is numbered to correspond with an index on the cabinet top. The cabinet itself is of table type, so that layouts may be displayed on top, four sections at a time, for detailed study and discussion. The sections on display may be conveniently interchanged with any of those in the cabinet in a matter of a very few seconds.

Standards Adopted

To assure uniformity, all layouts are prepared according to standards especially adapted for use at Marathon. These standards provide that:

1. A uniform scale of ⅛ inch to the foot shall be used on all plant layouts.

2. The flat surface of all layouts shall be 8x8 to the inch graph paper (this sets off all floor areas in square feet and provides a readily visible index of distance).

3. Plastic cord shall be used for the indication of building perimeters and partitions, work areas, storage areas, and conveyor lines.

4. Plastic sheet material shall be used for templets to represent machines and movable equipment.

5. Building column lines shall be indicated by numbered and lettered index tacks on the vertical and lateral lines, respectively.

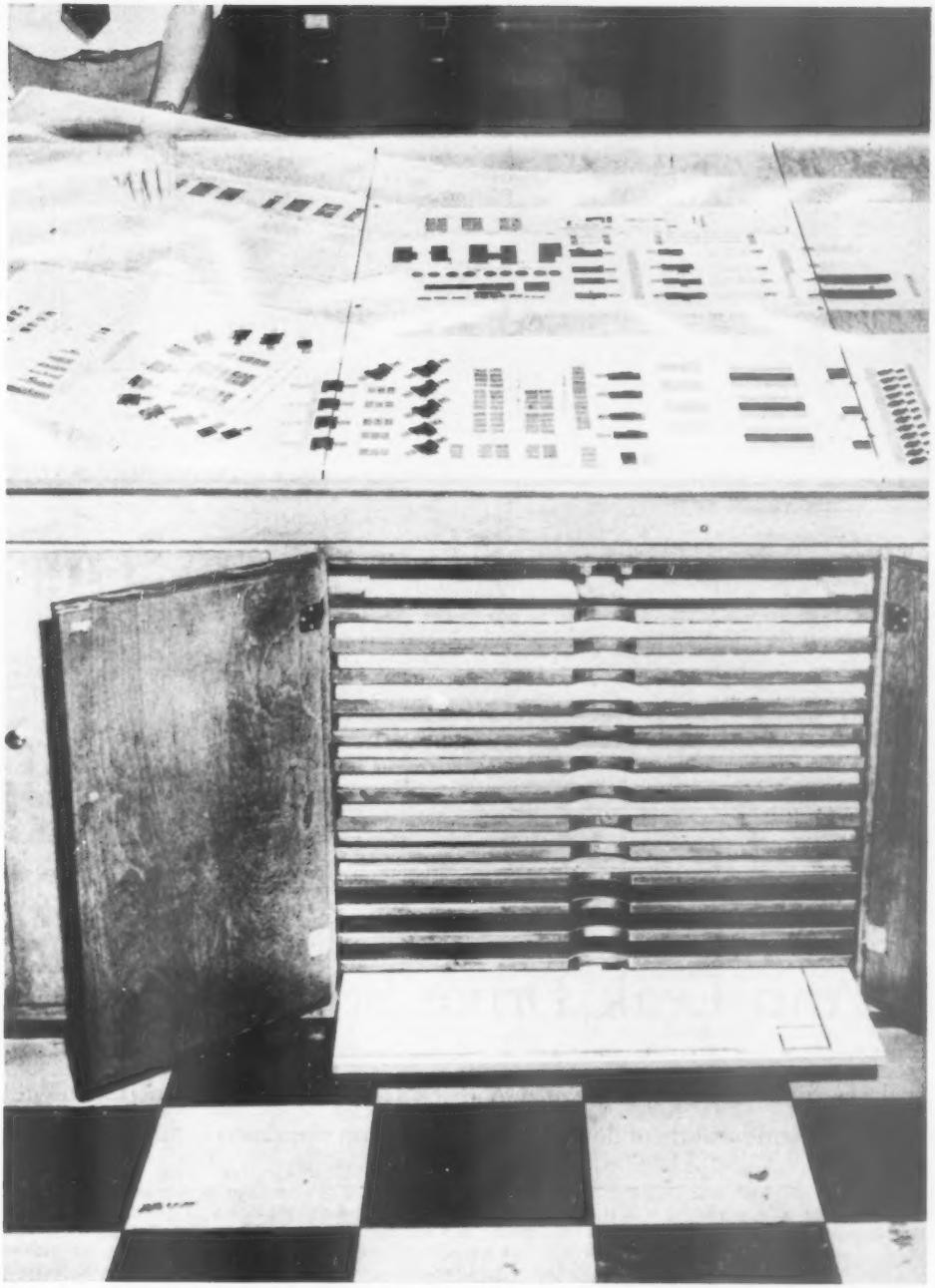
A special color code was developed also, to facilitate interpretation of the layouts. Here, for example, is the coding used for the flat plastic cord which represents building perimeters and partitions: black cord represents existing construction; yellow indicates future or proposed construction. Other colors are used to distinguish such elements as power and gravity conveyors, work space, storage areas, and aisleways. However, the black and yellow scheme is carried over to machine templets to distinguish between existing and future or proposed equipment.

Planning a New Layout

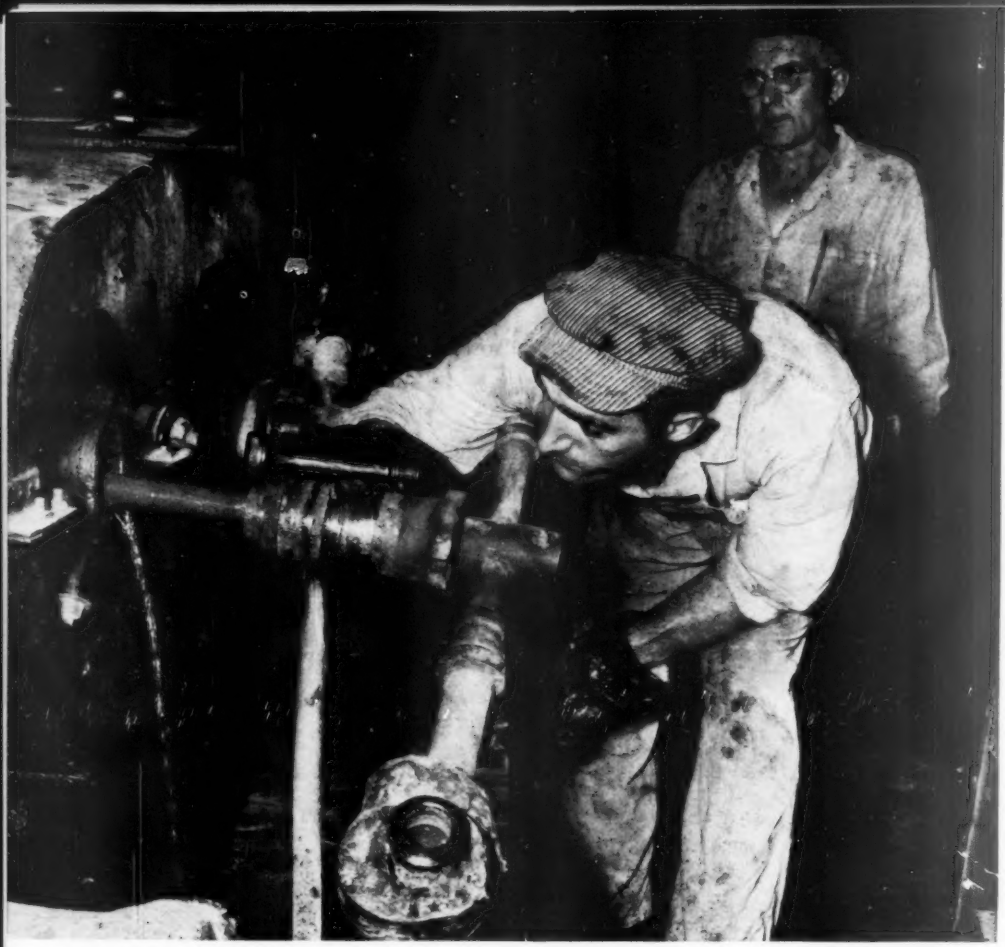
Where new machine lines or major changes in existing lines are contemplated, working layouts are employed. Blank sheets of plywood are placed on the layout cabinet to form a work table. A white print of the manufacturing area affected is stapled to the plywood top, and loose templets of the equipment are placed in position. The templets are shifted until the layout of maximum efficiency is obtained.

The entire arrangement is then covered with sheet acetate which keeps the templets in position. Conveyor lines, storage areas, transportation routes, and other flow lines are then scored on the transparent sheet. This working layout is used for discussion, study, and comparison. When adopted as final by the department supervision affected, the maintenance department, top management, and the layout supervisor, it is transferred to a master and placed in the permanent storage cabinet.

To supplement this system, Marathon sometimes uses three-dimensional layouts—for example, in the solution of special problems where scale models serve best to illustrate a proposed improvement.



MASTER LAYOUTS of every floor of every building in Marathon's five-plant operation are stored flat in a cabinet in the layout department. Cabinet holds 56 plywood-mounted layouts in four compartments. Layouts may be displayed on top of cabinet, four sections at a time, for detailed study and discussion. Sections may be put back in the cabinet and new ones placed on display in a matter of seconds



LEAK SEEKERS at Goodrich hunt in pairs. Usually a member of the regular maintenance crew teams with a pipefitter. Often toughest part of the job is to locate leak, so flashlight is most effective weapon

Anti-Leak Drive Stops Waste

Leaks are like rats. They rob you. Goodrich's answer is to pair repair men with pipefitters, and hunt them down. During vacation shutdown is the time to do it

WM. P. SHEEHEY • MAINTENANCE ENGINEER, AND CLYDE O. INGRAM • POWER ENGINEER, THE B. F. GOODRICH COMPANY, AKRON

LEAKING "FREE AIR" COSTS The B. F. Goodrich Company $40,000 a year. In addition, losses from steam and water lines, although hard to tie down, are considerable.

Since it is practically impossible to devote the time to searching out these leaks while the plant is operating, we determined to conduct a "leak hunt" during our week's vacation shutdown. Although the 300 miles of piping in our main plant also included pipes for natural gas and solvents, we decided to make a special drive on preventing leaks of air, steam, and water —the three used to the greatest extent.

The anti-leak drive was conducted by sending out men in pairs.

BIGGER LEAKS are tagged for immediate follow-up by second crew equipped with bigger tools

HUNTING is at its best when the plant is down. Air leaks, for instance, have to be heard, not seen

LEAK HUNT is not all easy going. Leaks often occur in the most inaccessible places

usually one from the regular maintenance group and one from the pipe shop. These groups covered areas rather than any certain types of pipe lines. They carried only a few hand tools—pipe wrenches, screw drivers, and pliers—in order to stop small leaks as they went. Larger leaks were tagged either for a second trip or for a second crew of leak hunters equipped with heavier tools.

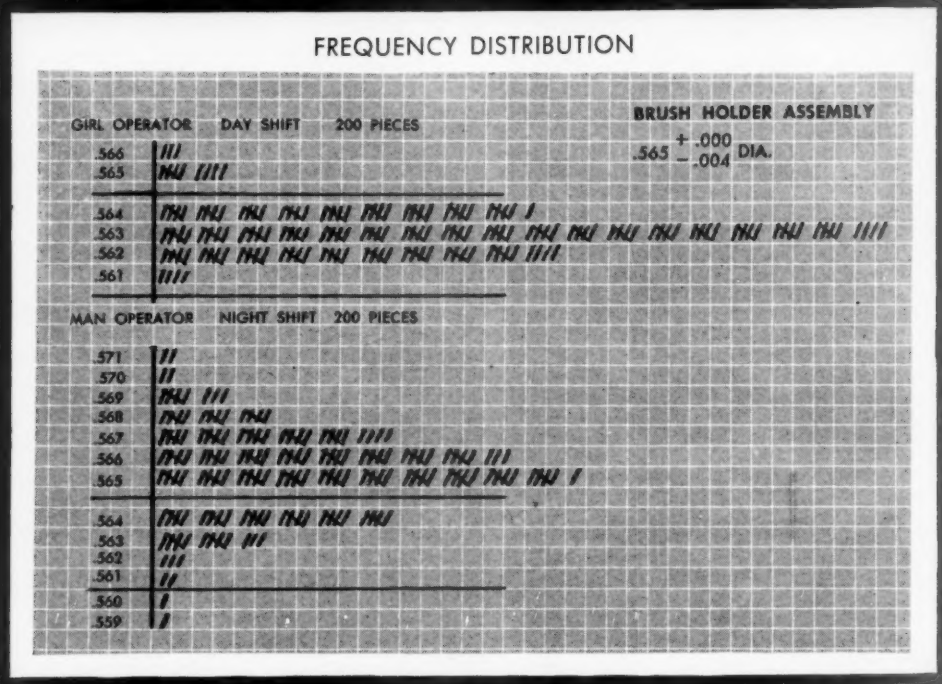
Unfortunately, no short-cuts were found in fixing leaks. Most effective was the old reliable clamp method of temporarily shutting off the escape until the service could be turned off and the pressure reduced. A preventive measure found to be very satisfactory, however, was to eliminate flange trouble by welding main-line flanges together.

Air leaks are very difficult to detect. They cannot be seen, but must be detected by hearing, which is often impossible when the factory is running. Not all air loss is through leakage. Much of the air goes through the pressure nozzles all right, but it goes for such things as sweeping the floor, for cooling off and dusting men, and for other uneconomical practices. Of course, these practices are strictly against safety regulations.

Leakage of steam or water is much easier to detect, but the cost is difficult to ascertain. Steam petcocks in the various departments are often left open too long while the operator assures himself a supply of dry steam without air. Estimating total annual loss for water is difficult with five kinds of water being used—surface, city, drinking, refrigerated, and hydraulic.

Naturally, the easiest way to fix a leak is to prevent it. Through the years we have kept our men abreast of the latest improvements in insulation and other handling techniques. As the term "high voltage" came to mean not 2300 volts, but 250,000 volts, we have sought safer and more efficient power line insulation. As "high pressure" water has risen from 250 to 2000 pounds, we have also realized that better pipes were the answer.

Leaks are like rats. They rob you. If you can't build them out, take your flashlight and hunt them down.



Statistical Methods Double Quality Control Efficiency

Seven statistical tools used by Dumore provide greater control of quality at its source, have brought savings of $30,000 a year from fewer rejects

S. E. PETERS • CHIEF INSPECTOR, THE DUMORE COMPANY RACINE, WIS.

QUALITY CONTROL by statistical methods has resulted in accountable savings of $30,000 a year from fewer rejects, reworks, and junked parts.

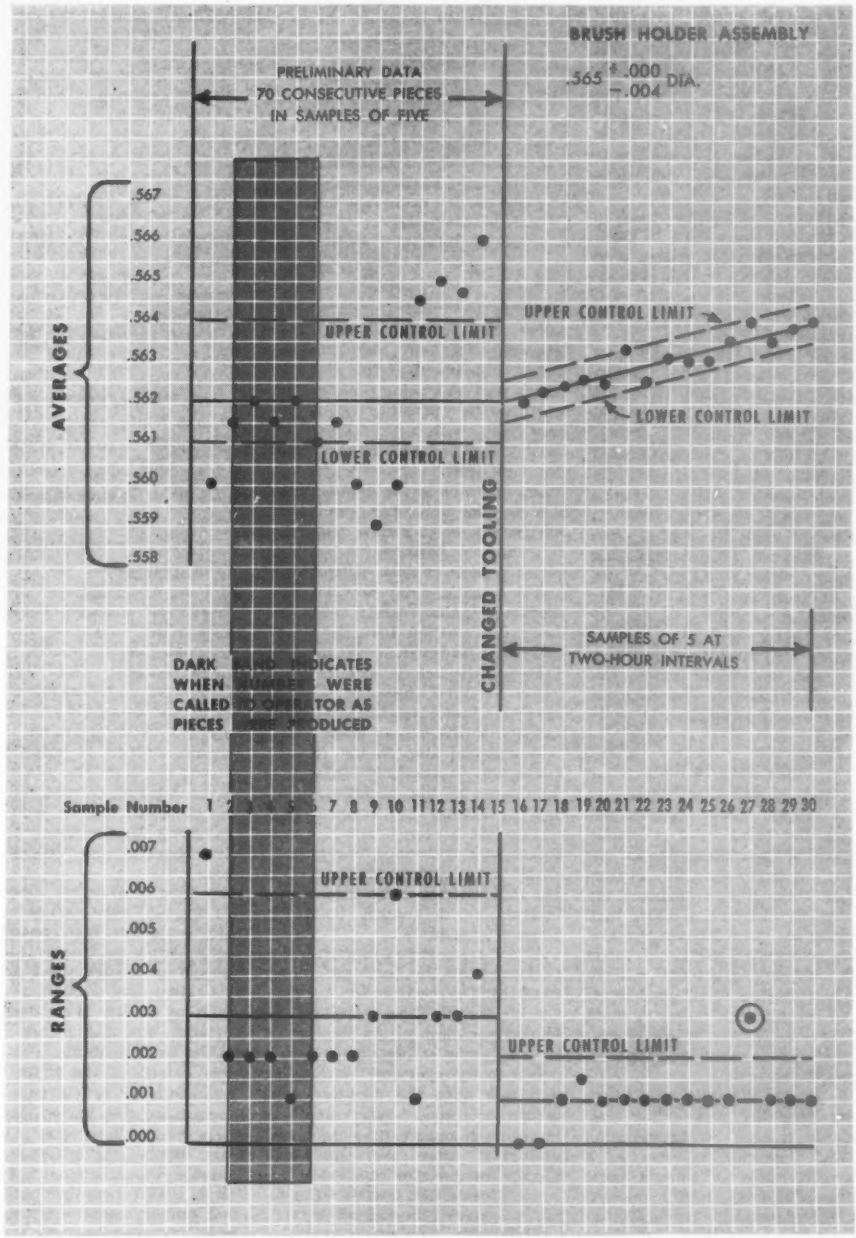
As used at Dumore, quality control is about 90 per cent engineering and traditional inspection, and about 10 per cent statistical methods. However, we have found quality control without the statistical methods to be only about 50 per cent efficient.

Traditional inspection, which maintains quality by screening out defectives, has very little positive ability to improve quality or to increase the efficiency of production. Statistical methods (which also facilitate traditional inspection) do have that ability to a great degree.

Seven statistical tools are used: three applications of the Shewhart control chart—two for attributes, and one for variables; the Dodge and Romig sampling tables; the frequency distribution; the analy-

SHEWHART CONTROL CHART FOR VARIABLES

A Process Control Chart for Averages and Ranges



sis of variance; and the analysis of correlation.

The *Shewhart* charts are designed to reveal significant conditions, trends, and changes in quality and thereby permit control of quality within economic limits. The *attribute* charts (go, no go; good, bad) are known as P charts and C charts, and deal with the count of defective units per lot, and the count of defects per unit, respectively. The *variables* chart deals with the variation of measurable characteristics such as dimensions and weights.

The Dodge and Romig *sampling tables* provide the utmost in economy of inspection compatible with reasonable degrees of risk and assurance, where 100 per cent test and inspection is impossible or is not required.

The *frequency distribution* is a quick, simple, and graphic method of presenting variables data to show the major tendency and the spread of the variable.

The *analysis of variance* is used to determine whether or not a significant variation exists between two or more variables, between spindles of multiple spindle machines, between similar machines, between cavities in multiple molds, jigs, fixtures, and so forth. The *analysis* of correlation is used to determine whether or not two or more variables are dependent on each other, and the extent of the dependence. These two types of analyses are used primarily in trouble shooting.

Tools Easy to Use

All of these tools are simple and easy to apply. Their use does not require the services of a mathematician, a statistician, or an engineer, any more than the services of a machine design engineer are required to operate a machine tool. However, a certain amount of training is required to develop a good machinist, and by the same token a certain amount of training is required for the application of these statistical tools.

Here is an example of the Dumore plan in action:

The outside diameter of a brush holder assembly was giving considerable trouble. Wide variation of this dimension resulted in a high percentage of junked parts and reworks, and a high inspection cost for screening. Inspection at the machine not only failed to eliminate trouble, but made it worse by causing—as was later revealed—frequent and unwarranted adjustment of the machine.

This part was being produced on one machine operating two eight-hour shifts, with a girl operator on the day shift and a man operator on the night shift.

The first step in the investigation was to take a random sample of 200 pieces from each shift and make a frequency distribution of the measurements of each sample. This revealed that the day operator was producing parts with a narrower range of variation than the night operator. However, both samples were "off the beam," and the only result obtained thus far was an indication that part of the variation was due to the human element.

The second step in the investigation was to measure 70 pieces as they came off the machine. These data were then sub-grouped into samples of 5 pieces, and the statistics—average, range, and control limits—were computed. These data and the statistics were then transformed into a control chart for graphic presentation.

An experiment worth noting was performed at the time the pieces were being taken from the machine and measured. The inspector, on finding the first pieces tending to be low, began calling the measurements to the operator. As long as this was done the operator kept within tolerance. But when the inspector stopped calling the measurements, after the thirty-fifth piece, the operator again lost his sense of direction or feel. The resulting chart reflected all of this.

From the factual information now at hand it was evident that the quality was wholly and indisputably a victim of the human element; but that, paradoxically, the operators were not to blame. The conclusion: any process requiring close control, and depending on the human element *to the extent that this one did*, is not good.

The foreman, on seeing the facts, had an immediate solution. The tooling was changed, and the trouble came to an abrupt end. A frequency distribution of two hundred consecutive pieces taken off the machine, and hourly samples of five pieces taken over a two-shift period, showed that the uncontrollable human element had been eliminated, and that the operation could go two shifts without stopping for adjustment or tool sharpening.

The net result was as follows:

	Per Cent
Direct labor, *down*	24
Total labor, *down*	33
Rework, *down*	100
Inspection labor, *down*	100
Machine time, *down*	24
Junk, *down*	100
Operator earnings, *up*	3
Net production, *up*	32

Statistical methods contain the elements of prediction and warning which prevent rejects, reworks, and junked parts. Statistical methods also reveal when corrective action should or should not be taken; they aid in determining the economical amount of inspection required; and they also provide data for establishing rational tolerances and specifications, as well as for evaluating the quality characteristics of men, machines, and materials.

As used at Dumore, these methods are also responsible for many benefits which are apparent but which cannot be directly calculated. Among such advantages are: The realization and acceptance of the fact that quality is an inescapable variable, but that it can be controlled within limits; the knowledge gained of the characteristics of variation; the increased effort to measure this variation and express these measurements in numbers; better gaging practice; and reliable, immediate, and adequate records. We are convinced, too, that proper use of these statistical tools has played a definite part in improving employee relations.

The American Way

Every move we make to limit profits in this country carries every last one of us dangerously closer to the tyranny of systems in which we want no part. For profit is the life blood upon which both individuals and business live and thrive in this nation.—*From an advertisement published by Standard Steel Spring Company, Coraopolis, Pa., as a contribution to a better understanding of America's greatness.*

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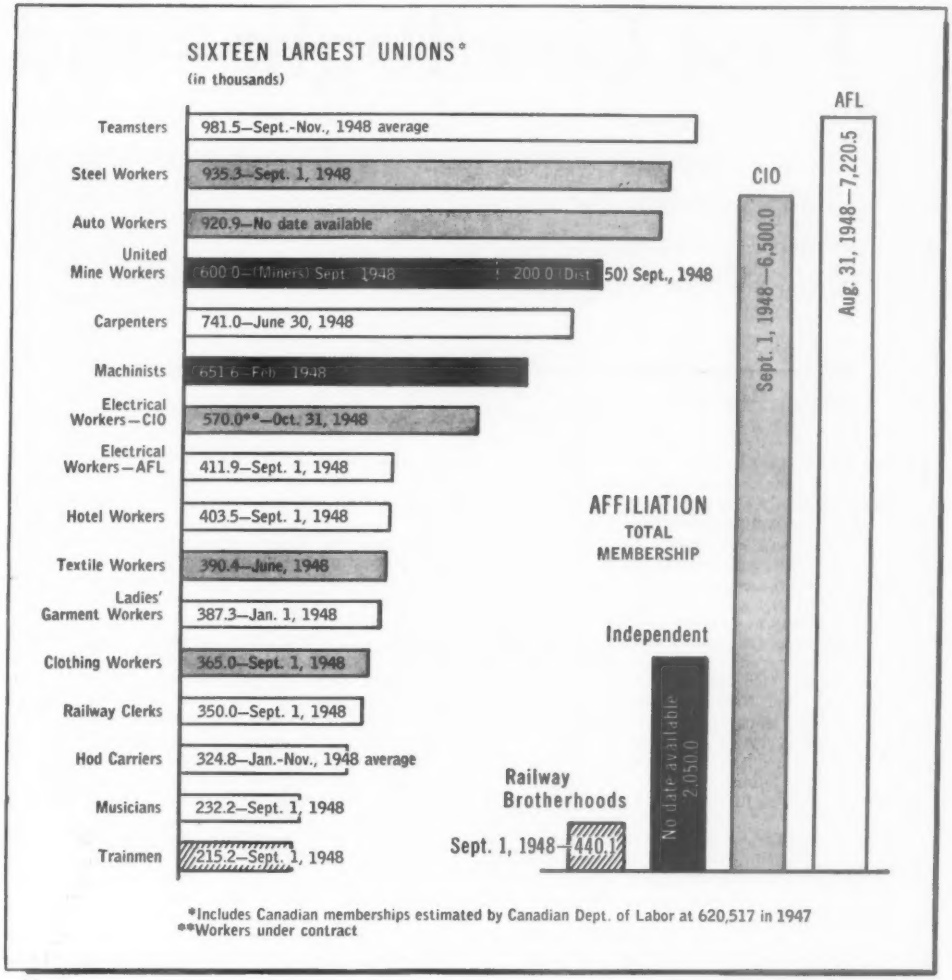

Union Membership and Affiliation United States, 1948

UNIONS WITH HEADQUARTERS in the United States claimed membership of approximately 16,210,000 in 1948. The figure includes Canadian membership of international unions, estimated at 620,517 in 1947, and leaves United States membership at approximately 15.6 million. The sixteen largest unions account for approximately 8,680,000 members, or more than half of the total union strength. (All figures except for UAW-CIO supplied by the unions.)

SOURCE: The National Industrial Conference Board's "Road Maps of Industry" Series. Copyrighted by the Board and reproduced with special permission.

First Live Right—and

. . . Tell employees. Tell the public. That is the concept of public relations in a company that has learned how to live in some 200 cities and towns. . . . Its program makes good sense. It can be used "as is" by others. So here is the story, as the president of the company tells it

JOHN L. McCAFFREY · PRESIDENT, INTERNATIONAL HARVESTER COMPANY, CHICAGO

PUBLIC RELATIONS, as we use the term at International Harvester, is primarily something you do. We believe that only after you have done it can you talk about it. The words can never be a substitute for the act. There isn't any method known to us by which you can kid people into thinking that you are something which in fact you are not, or that you have done something which in fact you have not done. And there is no method known to us by which you can kid people into thinking that your motives for doing something are different from your actual motives—not, at least, for any very long period of time.

The International Harvester conception of public relations is that it should constitute a continuing effort to conduct every phase of the company's business to merit and obtain the favorable regard and confidence of the public.

This policy can be further stated in a positive and in a negative way:

Positive. To do as many things as possible, within the limits of sound business practice and procedure, that the public will approve, and to do them in the way best calculated to leave a good impression with the public.

Negative. To reduce to the minimum the number of practices which tend to irritate the public, which cause misunderstandings, and which undermine the respect and confidence in which the company is held by the public.

With us, public relations is not primarily a question of techniques. We don't emphasize the issuing of news releases or special pamphlets. We aren't concerned primarily with the production of radio shows. All these things are involved, but they are just the secondary steps in the process. When we talk about public relations, we are talking fundamentally about an attitude of mind, and about the performance of deeds. We look on public relations as encompassing two things—first, *doing something;* second, and only then, *telling a large number of people about it.*

You could use various more or less academic or fancy terms for this act of doing something. You could talk about it as social integration or as social consciousness. You can sum it all up better, however, by simply calling it *doing the right thing, in the right way, at the right time, and then telling people about it. That is our concept of our job in public relations.*

It seems clear to me that any sound public relations program has to be based on *action.* It cannot be merely a matter of arranging words impressively or buying a certain amount of newspaper space or radio time. The words are fine. The words are important. But they are no good until something has actually been done, either by the adoption of a policy or by the execution of a policy.

It seems equally clear that both our acts and the words in which we describe them must be honest and candid. We must actually be doing what we say we are doing. We must actually be doing it for the reasons we give, and not for some other reasons.

To our company these two things are basic. There must be action. There must be candor.

The essence of the International Harvester concept is simple. It recognizes that there is no difference between the way in which an individual becomes liked and earns the respect and confidence of his associates in the community, and the way in which a large corporation or a small business earns the same valuable reputation. The same basic qualities get results in both cases. That is why individuals count for so much in the public relations activities of our company. The company can never have a good public relations position in a community in which its individual employees are not held in respect. Good public relations can flow only from a forthright approach.

Public Relations Techniques

One of the problems of a large business is to keep people informed of what we are doing and why we are doing it. There are four large groups who have a natural interest in International Harvester, or any company—employees, stockholders, dealers, and customers. We try to keep them posted.

For employees we publish a monthly magazine, many special booklets, and other publications. Regular news letters go to managerial employees, both locally and from our general office. The factory managers write to all their employees. On matters of general importance, I occasionally write to all Harvester people at their homes.

Then Tell About It...

John L. McCaffrey started with Harvester as a $40-a-month warehouse clerk. That was in 1909. Just 31 years later, with a solid record of sales accomplishment behind him, he was elected vice president. During the war he was chairman of the company's postwar planning committee. And he participated in the company's postwar expansion, which involved the development of new products and the acquisition of new manufacturing and distribution facilities. He was elected president in 1946.

For stockholders, in addition to our annual report we provide quarterly reviews of operations and other information.

For dealers and customers we produce several magazines, a monthly dealers' news letter, and other publications of general interest.

To all these people, other friends, and the public generally, we give information about International Harvester through newspaper and magazine advertising and through our national radio program, "Harvest of Stars." We do these things because we think all of us work better when we know what our problems are and how we plan to solve them; and because we believe a company like ours has a public responsibility to report what it is doing and thinking, so that every one interested may know.

A typical example of this is business profits. In slide films, in institutional advertising, in booklets to all employees and dealers, and in posters, under the caption, "Profits Mean Progress," Harvester told its story of 1947 profits to all interested groups, including the general public. We pointed out that it was profits ploughed back into our business over a period of years which enabled us to embark upon a $215,000,000 expense program that resulted in jobs for 90,000 employees, where before there had been jobs for only 60,000 employees. The story of 1948 profits will be told to employees in a film and a booklet, and to the public in newspaper advertisements that show profits at work, now and in the future.

Keeping Employees Informed

Good public relations begins right in the company, not outside. No company can have good public relations if it has poor employee relations. The public will believe an employee's bad report of a company before it will believe something good that management may say. That is just human nature. Thus the neighbors of an employee in one of our plants will believe what he says about our company rather than an advertisement or radio announcement made by the company. A company without a fair and considerate policy toward employees has nothing on which to build a public relations program. It is in the position of trying to build a house without a foundation.

Employees cannot be good public relations repre-

entatives of a company if they are not well informed. We set out almost two years ago to try to make our employees a well-informed group. We wanted to be sure they knew what we were doing, and why we were doing that particular thing instead of something else. We do this through our "Employee Information Program."

In twenty of our major plants we have an information program. It is directed in most of these plants by a public relations man or an information editor. One of their major responsibilities is to keep the people in their plants informed of what the Harvester Company is doing, locally and nationally. Each week, for example, a newsletter is distributed to all the management people in that plant. It is roughly similar in form to a national business letter except that it is concerned only with the Harvester Company and primarily with a particular plant. It tells what the supply of material is; what our current problems are in labor relations at the plant; what the prospects are for continued employment and what has been happening to employment, whether it is going up or down; who have been visitors to the plant and where they came from; anything and everything that might be of interest, including the current production figures, the details of the moving of a department, purchase of new tools or equipment, all things of that sort.

While this newsletter goes to the managerial group, the news is not expected to remain there. Supervisors are expected and encouraged to pass on the information they get from these letters to the employees under their supervision.

We also produce what we call a managerial bulletin, which is like a newspaper extra. Things happen more often than once a week, so if something important occurs—a major accident, a work stoppage somewhere in the plant, the kind of thing that starts rumors flying around the place—we issue a bulletin with the hope of getting to everyone in the plant the exact story of what took place before the end of the shift. And in most instances we are successful in doing that.

Finally, we use in this program a letter from the works manager to the homes of all his employees. We use it when it is desirable that everybody in the plant have certain information at the same time, and in the same words. And very often it is desirable that not only the employee but also his wife and the other members of his family know what the situation is.

A Case Study in Community Relations

International Harvester is a citizen of about 200 different cities and towns in the United States in which we have manufacturing plants or distribution facilities. We think it isn't enough for us just to pay our taxes and observe all local laws and ordinances. As we see it, we have a larger responsibility to help make all those communities better places to live. If they are better communities for people to live in, they will be better places for us to do business in.

Immediately following the termination of the war, our company purchased three large war plants. One of them was in Evansville, Ind., an industrial community of about 100,000 people. We had operated a sales branch in that community for over 40 years, but our nearest manufacturing plant was almost 200 miles away. So we can safely say we were newcomers in the community. It was a fine opportunity to test community relations practices and gain some experience in that field.

When this particular community was being surveyed as a possible site for our new refrigerator manufacturing operation, various contacts were made with business groups, civic groups, and city officials. These groups were acquainted with the company's needs and requirements, as well as the general way in which the company expected to operate in the city. When the company decided to purchase the site and plant, a news release was furnished to the local press, announcing purchase, sale price, expected employment, date for starting production, products to be made, and nature of the make-ready task that had to be done. It described the plant site, announced appointment of key managerial people, and told of plans to employ people in the area. Local newspapers carried stories and commented editorially.

A month later, when the key staff men who were to operate the plant were on the site, we had our already established sales branch play host at a "get acquainted" luncheon. In attendance were representatives of civic clubs, other industries, the banks, the press, both CIO and AFL councils, women's clubs, and others.

Our division manager outlined the reasons for selecting this particular community and described in broad terms our general policies, placing specific emphasis on employment policies, including recruitment of labor in the area, upgrading of personnel, and policy toward labor unions. The informality of the meeting played an extremely important part in laying the groundwork for good community relations.

During the next few weeks all major industries and businesses were visited by one or more of the key management staff. Friendly contacts were established, and questions regarding our policies, aims, objectives, and plans were answered freely and frankly. Information was exchanged with other industries, particularly on matters of rates, wages, salaries, and other industrial relations policies.

The director of public relations and the division manager explained the company's public relations policy to the newspapers and acquainted them with Harvester's aims and policies in general, and for their community in particular.

Informative talks were made before civic groups. Numerous speeches on the history and development of Harvester were delivered by key management men. Every civic body in the community heard the story of Harvester, its origination, development, policies, and plans for the future.

Participation in community projects is of course important. Employees participate actively in the conduct of community chest and Red Cross campaigns, and the company makes substantial contributions to these funds.

Our purpose has been to integrate ourselves completely into the pattern of community life and to participate actively in the various organizations that serve the community.

We also use institutional advertising. For example, we published an institutional advertisement in the local papers entitled "Here's What We Are Like," outlining our policies for employees.

A part of the orientation course for new employees is a discussion of public relations. Employees are

told in this discussion that the company recognizes that it is a social institution with social obligations, and that it tries to function as a citizen of the community. Employees are also told that the company can be a more effective member of the community if all its employees are good active members of that community. Employees are therefore urged to participate actively in community affairs.

Our plant magazine is distributed not only to employees, but also to all other industries and representative businesses in the community, including the local newspapers.

During a two-week strike at our plant, we issued daily press releases to the newspapers and radio on the status of the strike, the issues involved, and the progress of negotiations. The day after the strike occurred we ran an institutional advertisement citing the facts about the stoppage and the two issues in dispute. We also wrote almost daily letters to employees, keeping them advised of the status of the strike. There was no attempt to color or distort the facts for the purpose of improving the company's position in the eyes of the employees or the public. We tried to keep our publicity wholly factual.

Following settlement of the strike, we ran a second institutional advertisement explaining disposition of the issues and welcoming employees back to work. The message to employees, which had first been sent through the mails, expressed our gratitude that the strike was over and assured them that the company bore no ill will.

We have held an open house, for employees and their families particularly. We have had civic clubs in the community hold meetings in our plant cafeteria and tour the plant, guided by members of our management organization. We are going to invite the school teachers from each school in the community to be our guests at dinner and tour our plant. There will also be plant visits by other groups.

Whatever we have done in the past, or will do in the future, is a part of a complete program designed to tell the community through all available channels everything it wants to know about our company and the way it operates. As we see the problem, people react most favorably to the things they understand and are familiar with, and are inclined to be suspicious and unfriendly toward the things they do not understand or with which they are not familiar.

Conveyor Cuts Welding Delays

A POWERED BELT-CONVEYOR LINE has reduced handling and increased production of gravity conveyor weldments at The Rapids-Standard Company, Inc., Grand Rapids, Mich. The powered belt-conveyor line feeds through the department, with welders working on each side.

OLD METHOD. Each welder would stack his weldments on hand trucks and when the load was full, it would be moved to the washing booth. This required excessive floor area, costly handling, and relatively slow production.

NEW METHOD. The powered belt-conveyor line is a horizontal unit with an impregnated canvas belt, and is positioned in the aisleway between welding work stations. As each welder completes his weldment he takes it from the special jig and lays it on the conveyor. This feeds it directly to the final grinding and inspection station.

Another space saver was installing the duct work for removal of welding fumes directly underneath the conveyor line. This alone saved considerable floor area and gave a good appearance to the line.

The welding department is now set up on a mass production basis. Work flows constantly and at a uniform rate, space is saved, and the welder's job has been made easier. Production feeds smoothly from welding through grinding and inspection to the washing, spraying, and baking operations.

HOW TO LEAD A TRAINING GROUP IN WORK SIMPLIFICATION

1. Plan your meeting:

The leader should have a plan for entire meeting, with enough reserve material to fill in at the end if necessary.

2. Follow your plan:

The leader should keep discussions on the subject the group is working on.

3. Keep minutes of meeting:

The leader should either keep minutes himself or appoint one of the group to keep them.

4. Lead the discussions:

Remember, the leader's job is to draw out ideas from the group. His own ideas should be reserved until last. When presented, they should be in the form of suggestions to the group.

5. Keep discussion between members of group:

Even if you are sure you know the solution to the problem being discussed, allow members of the group to express their opinions first. Be a good listener. Keep discussion going by directing questions to members of group doing least amount of talking.

6. Avoid arguments:

Always allow any member of group to give all the reasons he has for any change he may suggest.

Allow other members of group to express their opinions.

If you own opinions are negative, don't state them bluntly. Try to encourage more thinking by the group on the problem by asking leading questions pertaining to the effect of the change.

7. Give credit for good suggestions:

Any changes suggested should be recorded in the minutes with the suggestor's name at start; for example:

Dale Bowman suggests we do . . .

Howard Stafford says that this can be done . . .

Ideas that are finally adopted should be entered on a suggestion blank by the suggestor and the leader should follow up to make sure this is done.

8. Follow through on ideas:

One of the most important jobs the leader has is to follow through on ideas adopted by making sure they are put into effect quickly and used properly.

9. Do a better job with equipment we now have:

Our aim is to obtain ideas for improving our equipment, and we want a record of all ideas brought out in these meetings. However, our number one job is to do the best possible job we can with our present equipment.

There will always be a better way.

10. It can't be done:

Never say "It can't be done" or "We cannot do that." Discourage the use of the word "cannot" in your meetings.

How We Get Workers to Think

A program of training in work simplification provides a way to help employees develop ideas and encourages them to think about cost reduction

F. W. STEIN • VICE PRESIDENT IN CHARGE OF MANUFACTURING
THE STANDARD REGISTER COMPANY, DAYTON

Is IT WORTH WHILE to strive for bet- and simpler work methods in order to cut production costs? Ninety-three per cent of Standard Register employees say "yes." That figure is accurate. It was determined during a recent impartial survey of employee opinion.

We were interested in this particular opinion because we wanted to know if our employees were sold on work simplification. The answer we got showed us they were. It showed us that our approach to the problem of selling work simplification in a plant embracing six affiliated union groups and two independent bargaining units had been effective. It showed us that a Standard Register program carried out over a 10-year period was proving itself.

That program, in actuality, was the application of common sense and the old axiom that "two heads are better than one." We began it with the establishment of management councils composed of executives, foremen, and assistant foremen. They sat down together and worked out company problems. Those meetings were successful.

Our next step was to hold consultative meetings where foremen discussed departmental problems with groups of employees from their departments. These meetings, too, were successful. We found employees were eager to express opinions and ideas. We substantiated the belief that most employees are interested in the success of their company. Moreover, in addi-

WORK SIMPLIFICATION IN FIVE STEPS

To find the "one best way," the five steps below *must* be taken one step at a time. Don't go to the next step until you have completed the previous step.

STEP ONE • Pick a job

Pick a job that is:

1. Necessary
2. Worth improving
3. Probably giving trouble
   a) Bottleneck; b) Takes too much time; c) Requires chasing around for materials, tools, and supplies; d) Whose costs are too high

STEP TWO • Make a process chart, flow diagram or movie

1. Get all the facts about the present method
2. Use work simplification tools
   a) Flow process chart; b) Man-machine chart; c) Flow diagram; d) Movies
3. Chart an actual case on the job. —Don't depend on memory

STEP THREE • Challenge every detail; develop improvement suggestions

1. Keep an open mind
2. *Don't try to think why something won't work in this step—only how possibilities could work*
3. Procedure
   a) First challenge job as a whole; b) Next work on "Do" details; c) Then challenge *every* detail
4. In each sub-step
   a) First try to *eliminate;* b) Next try to *combine;* c) Then try to *change sequence;* d) Lastly, try to *simplify*
5. Don't leave this step until possibilities are exhausted

STEP FOUR • Work out a better method

1. Try out *all* suggestions
2. Develop agreement as to the "best way" as of today
3. Make a new process chart, flow diagram or movie
4. Repeat step 2, step 3, and step 4 on the new method
5. Finish the technical problem in this step
6. Plan the training movie
7. Write up the suggestion for suggestion contest and management

STEP FIVE • Apply the new method

1. This step deals with the human problem
2. *Remember* the two big difficulties in dealing with people
   a) Resentment of criticism
      a) There must be no hint of criticism of any person; b) People don't like to be told they are wrong
   b) Resistance to change
      a) No one will resist a change that he himself has originated
3. A real sales job is required
   a) Management won't "buy" the suggestion until they have been "sold"; b) Use devices—charts, pictures, diagrams
4. *Your* job isn't completed until *everyone* is using the new method.

About Ways to Cut Costs

tion to thinking of their own jobs, they frequently think of methods of solving problems confronting not only their own departments, but other departments as well.

These free and open discussions of opinions laid the groundwork for what was to come. Up to that time, three ways were open to the worker to offer his improvement ideas. He could (1) tell his foreman, who could carry out the suggestion; (2) express himself in a consultative meeting; (3) turn to our suggestion system.

But we realized that, although much progress had been made, we did not have the whole answer. The average employee needed an organized pattern to help him fully develop his ideas. He needed confidence to express his ideas more effectively. The answer was the development of a program of employee training in work simplification.

Six Conclusions

Before going any further, we did a little common sense thinking and arrived at some conclusions:

1. People usually are opposed to anything they don't understand.

2. It is important to get all concerned together and discuss various aspects of work simplification.

3. Men most likely to think of possible solutions to problems are those employees closest to the job. But in spite of their know-how, they remain silent because they are not vocal enough to bring out their ideas, even with a good suggestion system. Work simplification will give them a developed pattern to record and present ideas.

4. In work simplification groups, employees are challenged to make contributions.

5. A man never will resist a change that he himself developed, but he is opposed to that which he had no part in forming.

6. People resent having things shoved down their throats. They want to be asked and enjoy the feeling of participation which creates or increases job interest.

Four Basic Principles

We needed only to refer to the four principles on which we had established our counsel programs for confirmation of this belief.

1. Men carry into action best

that which they have had a part in forming.

2. Two heads are better than one.

3. All must be kept informed. More foremen fail from lack of information than from lack of ability.

4. Along with participation in management goes responsibility.

If these principles were observed, success in instituting a work simplification program seemed almost assured. If the foremen were helping their groups in organized work simplification meetings, they would be interested enough in the project to help those groups outside the meetings. We expected, by calling upon them, to get additional ideas for carrying out the program. By having the foremen participate in the program themselves, they would be fully informed of its progress at all times. By having them act as discussion leaders, a great portion of the responsibility for the success of the program would rest with them.

Refresher Course for Foremen

Foremen and division superintendents had already been trained in work simplification courses. Confronted with a proposal that they conduct work simplification classes, many foremen expressed a feeling of inability to train employees in program techniques.

So a refresher course was planned, extending eight weeks, with foremen meeting in groups of ten or twelve under the helpful guidance of division superintendents. The latter attended meetings only to keep the program's fundamental aims before the foremen. Training was conducted by our industrial engineering department.

In the first few meetings foremen were briefed on the need for a methods program and were re taught the procedure for completing a work simplification study. Beginning with the second session they worked through an actual project.

The eighth session had to do with learning how to conduct group training in work simplification. (See exhibit on page 92.) As a start, the members of the group flow-charted the teaching of a group by a foreman, enumerating the steps in the order in which they should occur. Discussions were held as to preliminary steps to be taken by a foreman before holding a meeting—what questions he should anticipate, how he should sell the group on the program. It was emphasized that foremen should not do any experting. They were told the value of the program lay in having trainees do the creative work.

Union Committees Participate

The next step was to pave the way for presentation of the program at the level for which it was intended. To do this, union committees were asked to participate in a course similar to that given hourly rated employees. During the course the company stressed its sincerity in requesting the help of employees. It was pointed out that such help was essential if the company was to continue to make profits, grant wage increases, and maintain job security. This group became convinced that work simplification is not a speed-up program, but actually reduces fatigue by eliminating needless operations.

The first program was started in the pressroom, with eight foremen in charge of three pressmen each. Trainees were given copies of a pamphlet outlining reasons for their participation. They also received copies of an outline of work simplification. (See exhibit on page 93.)

Meetings were held one hour per week, with the "you" angle stressed at all times. By the "you" angle we mean that trainees were shown how the program would benefit them directly. We pointed out the elimination of steps, lifting, and climbing. The trainees learned that the purpose of the program was to eliminate the things on which they already were working too hard, without benefit to them, the company, or the customer—wasted effort that added cost but no value to the products.

The first problem tackled by the group was a pressman's tray ticket, a quality report that had always produced more than its share of gripes. After the group's analysis, the number of entries required on the ticket was reduced from twelve to six. This one successful project alone did the final selling job. It convinced the men that work simplification would do for them what we had told them it would do.

In the pressroom, for example, eight projects are under study at all times. With completion of each project, the foreman selects a new group of three men to analyze the next problem. Thus a constant interest in work simplification is maintained by continued activities of organized groups. Groups often include employees from several different departments when an improvement project extends beyond the scope of the function of one department. This helps develop better cooperation between departments and heightens the interest of individual employees in over-all company problems. At the same time, each employee is encouraged to develop work simplification proposals of his own and to enter them as suggestions for prize awards.

The program now is proving successful. We are prepared to expand it until every factory worker at Standard Register is trained in the elements and principles of work simplification. We aim to equip every factory employee with a simple method of presenting his ideas for improvement.

Substantial dollar savings are indicated. At present, however, we are more interested in the program's intangibles. These are:

1. Elimination of aggravating details.

2. Reduction of paperwork.

3. Building confidence in the company.

4. Getting employees interested in their jobs.

5. Getting employees more interested in producing a better product at lower cost.

That, we think, would comprise an important list of achievements, even if no actual dollar savings were involved. What is more, while no wide program of training has yet been started among Standard's office people, the effects of work simplification training in the factory are noticeable among office employees as well. For that, we need only look again to our employees' survey.

Only 1 per cent of our employees do not think the company is trying to improve its methods of operation. Another 19 per cent think Standard is doing a fair job; 80 per cent are completely sold.

At Standard Register, we know all this is the result of a program, growing out of such an inexpensive and inexhaustible commodity as common sense—a vital complement to industrial management.

The importance of a regular maintenance painting program in an industrial plant becomes more logical and vivid when viewed from these plain facts:

1. **PLANT PRESERVATION . . .** It's far cheaper to maintain paint on buildings and equipment than to repair or replace them after deterioration from neglect has set in

2. **WORKER EFFICIENCY . . .** Clean, colorful workplaces attract good employees, build worker morale, reduce accidents, and serve to stimulate higher productivity

3. **PRODUCT GOOD WILL . . .** This valuable intangible of public favor in community and consumer relations gets a big boost with every new coat of paint on the plant

This article deals with the administrative problems of industrial maintenance painting in all its phases. It should prove profitable to executive management, plant engineer, and boss painter alike.

FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 118 • March 1949
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No matter who handles the maintenance painting program in an industrial plant, the problems of execution are the same. Whether management decides to use its own maintenance painting force or to call in a contractor, it wants the best job at lowest cost.

To accomplish this simple, valid objective, however, involves some complex factors. They are:

1. Determination of what properties need painting, and how often (page 96).

2. Organization of each job to keep plant production flowing with a minimum of disruption (page 98).

3. Determination of the type and colors of paint to be used and method of application (page 98).

4. Protection of the product, equipment, and workmen, and recognition of special hazards encountered on the job (page 103).

5. Provision of a force of skilled craftsmen to insure the best quality of workmanship (page 105).

In consideration of these factors there also is needed an appreciation of human reactions and relationships which, if ignored, can rob the whole program of its maximum benefits. For it will be shown that industrial painting takes not only engineering skill in conjunction with the specialized techniques of the painter, but also a dash of the artist and something of the psychologist too.

1 WHAT TO PAINT AND WHEN TO PAINT IT

Ordinarily, smart plant management doesn't have to be sold on the need of a paint job. It's good business. Or else management sees that the tiptop condition achieved during the war is fading out and wants to re-establish it.

Where management has no such convictions, the apparent need for painting has a way of becoming imperative. Workers reflect discontent with the shoddiness, even dirtiness, of their work environment in lowered productivity. Or there may be certain evidences of plant deterioration which are preliminary warnings that costly structural replacements are coming up because painting is long overdue.

What ignorance of these evidences means in dollars and cents is best illustrated by an example. The plant in question is a large one located on the heavily industrialized eastern seaboard. It has been long established in steel milling. Its management thought the plant was in pretty good shape.

A general painting clean-up job was proposed, and we were told to jump in and do the work. But before we jumped we looked, and while looking we found:

1. Corrugated roofing so badly corroded that the paint was practically all that was left. To have wire-brushed it would have scraped holes in the roof.

2. Steel rivets and holes so badly eaten by rust that many new beams had to be installed.

3. Rusted steel sash that had to be replaced.

4. Wood dry-rotted by water that had seeped behind cracked putty and through other openings. Once behind the paint surface, it attacked from the inside. The paint film covered decay. When you punctured the film with a putty knife, you cut into a damp sponge.

By the time we finished looking, management faced replacement costs three times the cost of the painting contract. It was all so unnecessary because there are ample forewarning symptoms of such decay.

These are the definite symptoms of decay that should be watched for in any plant:

WOOD SURFACES. Consider painting woodwork as soon as it is noted that the gloss has gone from the existing coat. The oil is dead; all that stands against the onslaught of the weather is a thin film of pigment. Also, when paint starts to alligator (creep into heavy mottling), wrinkle, or show cracks, it is time to repaint.

METAL SURFACES. Dead gloss is again a directive that the metal work beneath it needs repainting. Sometimes there is a preliminary symptom—the appearance of small bubbles while the paint still has a good glossy surface. In our examination work on oil storage tanks, for example, we watch for the hairline cracks and small bubbles which, if broken, reveal water eating away at the metal.

MASONRY. Masonry previously not painted should have immediate care when the first hairline cracks become visible. If previously painted, repaint when the gloss is gone and the surface appears dead, or when the paint shows excessive powdering.

WINDOW SASH. Watch the putty on window sash, both metal and wood. Often the paint on its surface will be good, but the putty beneath it will be dead, permitting water to seep under and cause rust or rot of the sash below. Caulking compound around the frames is similarly a weak point. On steel sash the bottom rail will be most likely to show the first signs of deterioration. Outside, where it touches the concrete and meets the weather, there is a chemical reaction. This is abetted by condensation on the inside.

PAINTING SCHEDULES RECOMMENDED

EXTERIORS. It is a good plan to check the outside of a building constantly to make sure that paint failure is not occurring. But it is better still to have a plant on a regular maintenance painting schedule for both its exterior and interior. The periodicity of such a schedule varies from plant to plant. It is dependent upon geographical location, weather exposure, and so on. Also, it varies because of other special conditions, such as corrosion by acids.

Generally speaking, we have found that steel sash should be painted every fifth year; wood sash, every fourth year, and masonry surfaces, every seven or eight years. There is a broad exception to this generalization—the sunny side of a building. Southeast exposures get a lot of sun during the day. The bottom

DETERIORATION soon becomes final when definite symptoms of decay are not heeded. Photographs show (1) failure of paint on wood door and frame; (2) deterioration and subsequent falling out of wood sash putty; (3) cracking of paint film on masonry; and (4) disintegration of back puttying on steel sash

rails of sash, sills, and frames for three inches up have to be gone over every three years, be they wood or metal. The rest of the sash, window frame, or door frame will be in pretty good shape.

The reason for this is that in the winter season snow and ice lie on the frames. They thaw during warm, sunny days. The water runs down to the sills and recakes when caught by the late afternoon and nighttime freezes. The alternate thaws and freezes split the paint surface, water seeps into the wood, or lies against the metal, and the result is a worse condition than if there were no paint surface at all. Moisture exposed to air will dry. But once it is underneath the paint it cannot dry. It remains there and causes rot or rust.

A large baking plant in Philadelphia offers a good example of this phenomenon. The sills on the sunny side of this plant have to be done every third year. The rest of the frames are painted every fifth year. But on the shady side of the bakery building the wood sashes are good for an average of seven years.

Sudden and wide variations in temperature play hob with schedules for the repainting of metal surfaces. When metal expands or contracts rapidly, the paint surface splits open and curls. Wood and masonry surfaces are not subject to such spectacular disasters. Wood is porous, and paint reaches into the pores to make a bond that holds against rapid expansion and contraction. In masonry there is a similar completion of a bond, but on metal work the paint has only a slippery surface to grip. Therefore when metal expands and contracts rapidly it pulls away from the paint.

INTERIORS. There are many signposts to the need of interior painting. But foremost in any plant where no special corrosive action is caused by product manufacture are shabbiness or dirtiness. Managements of some plants for many years thought that dust and dirt lying on steel members protected the surfaces just as well as a coat of paint. It was a misconception particularly prevalent in the phosphate fertilizer business. At one fertilizer plant we were given the argument that the super-phosphates coating the steel were just as good protection as paint could ever be. That argument collapsed with a bang when the roof came tumbling down.

Examination disclosed that the steel trusses supporting the roof had completely rusted away beneath their layers of super-phosphates. If proper periodic examinations of this building had been made by competent men, this catastrophe could have been avoided. But such examinations have to be thorough. Painting inspectors must know where to look and what symptoms to look for. They must be willing to get dirty. Like mice, they must run the foundations, beams, and rafters, poking into remote corners and hidden places. Layers of dirt over steel work may hide deterioration by rust to the danger point. Or even where nicely painted truss members have angles back to back, the narrow intervening spaces inaccessible to cleaning or painting may prove excellent hosts to corrosive rust. It takes a curious, conscientious inspector not to miss any vital points like these.

Besides ferreting out the bad spots, a good inspector also knows where repainting is a waste of money, and where other protective measures are called for. For example, there is no use painting floor columns that are constantly being bumped by trucks that break the paint surface. The answer is to encase the columns in concrete throughout the length of the collision points.

continued on next page

2 HOW TO PAINT WHILE THE FACTORY WORKS

THE PRIMARY REQUIREMENT in painting work in a plant is to organize the job so that it will not log-jam production flow. The second is to keep the painters busy a full 8-hour day. These objectives require a job schedule.

In drawing up a schedule, first make sure that no departmental shutdown is expected in the near future for other maintenance work, installation of equipment, or relayout. Very often a painting job is poorly planned in that management will go ahead and paint during production operations at an excessive cost, involving overtime. Then shortly afterward it will shut down the department for a week or two to make a change-over. This is the time when the painting could have been done at lower cost.

If there is to be no shutdown, the next step is to analyze the plant for painting requirements. Methods used at a large rubber tire plant in Maryland will illustrate this technique. There we laid out a 3-year painting program. Those areas urgently in need of painting were given a No.1 classification. Those that needed painting, but less urgently, were classified No.2. Those in which painting could be even longer deferred were classified No.3.

No.1 areas were scheduled for completion in the first year. The production flow sheet for the plant was studied. From it were tabulated the times when each of the areas would be available for painting, and the man-hours necessary to complete each one.

Certain departments worked 24 hours a day, 6 days a week, and were accessible to painters only on Sunday. They were designated "vital areas." There were others that worked 2 shifts a day, 6 days a week, and still others that worked 1 shift, 6 days a week. There were other areas, such as the warehouse, where it didn't matter how many hours a week they were busy, because painting could be done at any time without interference.

The plan finally formulated was to keep a fixed number of painters working at the plant. They were to be kept occupied in the uncluttered and easy departments. From them could be drawn the needed force for painting a vital area the instant one was open to us.

How such a plan works out is demonstrated by a specific example in the same case. The tire-building area required an estimated 300 man-days of painting time. To keep interference with production to a minimum, it was decided to paint this area only during shutdown periods. These occurred only 1 hour in 24, except for a full 24-hour shutdown on Sundays.

The tire area was completed by using 6 painters during the daily 1-hour shutdown and a full crew 24 hours on Sundays. During the regular working days, as soon as the 1-hour period for painting had elapsed these painters moved into another area, predetermined in the survey, where their painting did not interfere with production. The point to be made here is that there must be the required number of painters ready to do a job when the job comes up. Whether a plant owner or a contractor, you can't expect to go out and hire a painter for one job alone.

It is a fact, however, that no job of this character can be started without some lost time. In a typical case we started with a small crew while the plant was in operation. There was lost motion in the beginning. Gradually the plant gave us more space and gradually we built up our crew. When a 2-week vacation period started, we had a fully force keyed to take over.

Getting the Factory's Cooperation

Success of a painting job depends not only on the mechanics of programing but also on the recognition of human factors.

Here's how *not* to do it . Move into an area with painters and say: "Okay, boys, we're going to paint this place up." But are you? The foreman's back goes up, or the superintendent begins to raise objections that all imply, "I'm making it tough." And usually they can. But call them in and say: "This is your department and you have certain problems here. We want to know what they are and respect them. But remember one thing—we still have to do this room and you have to live with us while we're doing it. Let's sit down and work it out together."

Give them a chance to talk it out. Their advice doesn't have to be followed, but a discussion of this kind usually winds up with their asking what you want "so we can see that you get it." Who says psychology has no place in industrial painting?

3 WHAT PAINTS TO USE AND HOW TO APPLY THEM

PAINTS MOST GENERALLY USED in plant maintenance fall within the following broad specifications. There are, of course other preparations to meet special or unusual conditions, which will be mentioned later, but these, to begin, are the stock-in-trade items.

Interior wall and ceiling finishes are usually titanium-base pigmentation in synthetic resin vehicles, in whatever combination and refinement necessary to produce flat, semigloss, or gloss finish, as may be desired. Flat finishes have less glare than materials having a gloss, while semigloss and gloss finishes, generally speaking, have a higher degree of washability. One-coat, self-priming, flat finishes are in common use today for general clean-up work. These materials are usually titanium-base pigments in specially processed linseed, tung, or soy bean oils. Where color is no object, aluminum pigments are finding ac-

ceptance in some heavy manufacturing industries.

Paints for interior metal work, trim, doors, windows, and dadoes are usually combinations of various pigments (determined by color requirements and possibly rust preventive qualities) in a harder-drying synthetic resin vehicle.

Lead, zinc, or titanium pigment in a linseed oil vehicle is the accepted combination of material for exterior woodwork, particularly in white and tints of white. Dark colors, such as chrome greens, browns, blacks, etc., are preferred in alkyd resin vehicles. The better grades of exterior paints for metal are also desirable in an alkyd resin vehicle, the pigmentation being governed by color requirements and rust preventive qualities. Our experience has shown that pure turpentine is still the best thinner for obtaining good surface coverage and long lasting protection.

SURFACE PREPARATION

The best of paints and protective coverings will not compensate for poor, unreceptive surfaces. As any knowing painter will testify, good surface preparation is a prerequisite to a good painting job. Sometimes it involves only the simple steps to insure the surface being clean, smooth, and dry. Other times, as we shall see, it requires special precautions that take more time than the application of the paint itself.

No discussion of the well-known techniques of surface preparation is intended here, other than to stress their importance in the work program. Skimping on surface preparation may reduce the job cost considerably, but it will also ruin its effectiveness. For a single-coat job, surface preparation will justify 45 to 60 per cent of the cost where conditions of corrosion or paint failure exist. Cost of removal of dirt and dust in the average plant ranges from 5 to 10 per cent, and cleaning of structural steel on a brush job about 40 per cent. These figures are based on the use of modern methods to be mentioned later.

DIRT AND DUST. Ordinary dirt and dust are the most prevalent obstacles to paint adhesion. In production areas the need for removal of dirt is obvious. But don't assume that assembly or office areas that look spic-and-span to the eye are already sufficiently clean.

At a certain plant making delicate airplane instruments the final assembly room was constructed to be, as was thought, dust free. It was air conditioned, and each of the three small entrances had an air lock in which the entering worker was subjected to a stream from an air hose that was supposed to blow the dust off him. After three years' assembly operations we were called in to paint the room. We took out a truckload of dust.

Modern tools and methods for surface preparation will simplify the work and keep down the cost. These include the use of steam for cleaning off thick dirt or dust, special burning torches fueled by portable propane gas generators, and, as always, compressed air for dustings. Air or vacuum cleaning will remove surface dust, but will leave a greasy surface intact. No washing down is needed, however on a two-coat job if a proper solvent is used with the first coat that will dissolve surface dirt or grease. Power handtools, such as pneumatic or electric hammers and wire brushes, often can advantageously replace the handbrush, scraper, and elbow grease.

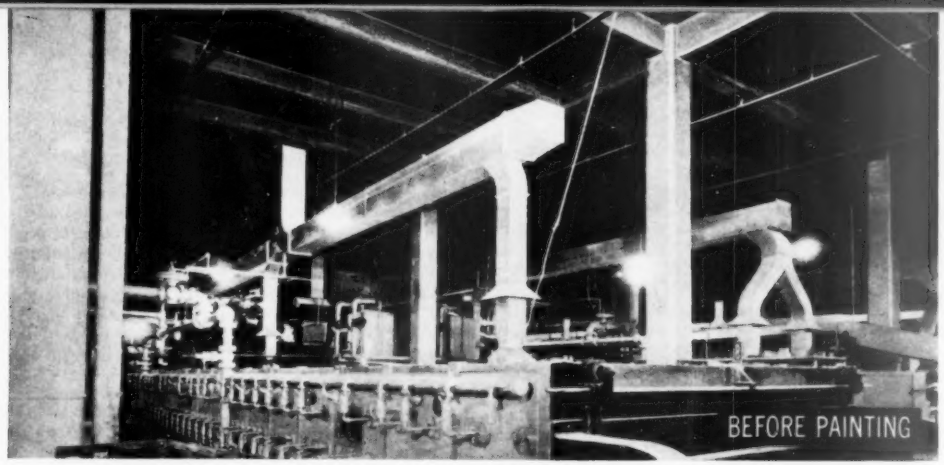
MOLD AND MILDEW. High humidity and consequent mold growth are two of the conditions most frequently requiring specialized approach. They exist in some areas of tobacco, textile, brewing, and food plants.

Here surface preparation is a primary consideration. The mold must be disposed of first by washing down the surfaces with a strong solution of formaldehyde. The proper paint protection can then be found among the many vinylite, resin, or rubber base materials. But we have seen walls again black with the mold 90 days after completion of such treatment. That was because management assumed that painting was the cure-all. The mold must be kept from lodging and

MODERN TOOLS AID IN SURFACE PREPARATION

ROTARY BRUSH, air driven, used here to clean the surface of a steel tank before painting, makes quick work of what once was a slow, tedious hand operation

PROPANE GENERATOR supplies gas used to burn off old paint. Better and faster than the gasoline torch. Job can be done in about one-fourth the time



DARK, DIRTY WALLS AND CEILINGS. DISMAL ILLUMINATION. NOTHING AT ALL TO ENCOURAGE WORKER EFFICIENCY

growing by periodically washing or wiping the surface with a mild solution of formaldehyde, sometimes every few days, sometimes only once in six months.

HIGH HUMIDITY. The outstanding maintenance painting problem of the textile industry is created by high humidity. The time to meet this problem is when the plant is built, not when it is in operation and humidity has become an integral part of it. If the original paint job is adequate, there is no problem in maintaining it, provided management repaints before the surface loses its good film protection.

Currently we are faced with just such a situation in a textile mill in Alabama. To do other than a makeshift job would require shutting down the mill for 120 to 160 days. The plant ought to dry out before the paint goes on. But management has no inclination to lose that much production.

Moisture is not always that hard to beat. It depends on what causes the condensation. A rayon manufacturing plant in Virginia required painting badly because of a mildew condition. The condensation that nurtured the mildew was present, we found, only when the temperature outside the plant was markedly lower than the temperature inside. Management wanted to paint in October. We suggested that it would be better to wait until spring when exterior and interior temperatures would be closer to equalization and the condensation factor would be at its lowest. The job was done in the spring.

On the other hand, no paint will waterproof the interior of a leaky wall, or one through which moisture is seeping from the outside. The leakiness causes constant pressure on the undersurface of the paint until the paint is bulged and finally pushed off. There is no use painting over such a condition until cracks are chinked and the exterior surface waterproofed.

ACID CONDITIONS. The need for proper, original painting in industry where acid or caustic conditions are prevalent, as in the petroleum or paper industries, is equally acute. There are good acid-resistant paints, but once acid has eaten through the original protection or into the surface, there is no use painting while the acid condition persists.

Rust on the structural steel or piping in an acid plant becomes impregnated with the acid in a mild form. Try as you will to clean it, before you can paint a running foot it has collected more acid.

WHY COLOR IN THE PLANT

Undeveloped until recently is another aspect of industrial painting—the aesthetic approach, not for decorative effect and emotional reaction alone, although that is not to be laughed at, but the hard-headed, practical approach that makes feeling for color a servant to efficiency. The need for good light in industry is an accepted fact. But it still needs to be generally understood that scientific use of color will provide for best utilization of good light.

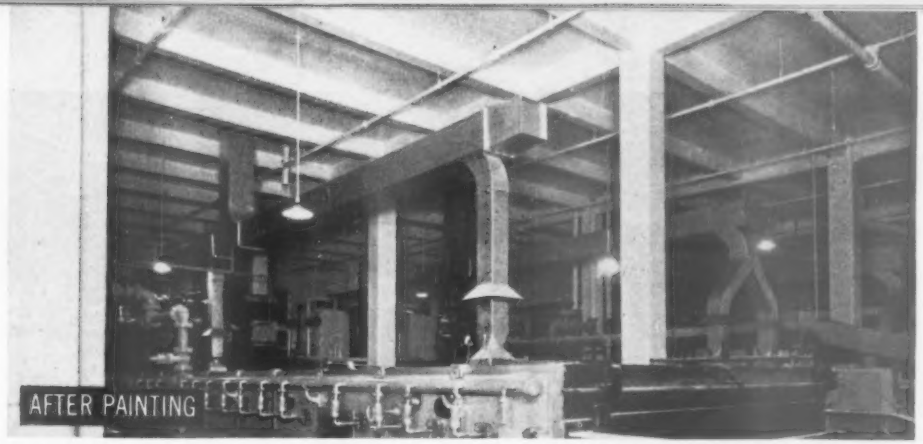
The objectives of color are to reduce eye-straining glare in favor of light diffusion, to focus worker attention on the operating parts of machines, give the workers "eye rest" areas for eye relaxation, give danger areas high visibility, and improve the appearance of the plant. The results are proving pragmatically practical—reduction of absenteeism, higher production, reduction of injuries, and better morale.

Give Color a Try

We feel industry can do still more with color than it is doing. Color costs no more than the traditional gray or white, but factory management is still inclined to regard it as the ornate touch of the artist. An example of this difficulty—and we want to add right away, an example also of the customary gratifying aftermath—was our experience at a well-known cigar plant in Philadelphia.

After considerable study, we proposed that in doing over the executive offices the ceiling be painted in a dark soft green, two walls in a light green, and two in an ivory. There was an excessive amount of light in the office. There were a lot of pipes, ducts, and beams on the ceiling. The proposed ceiling tone was designed to cause them to recede and, simultaneously, to kill glare from highlighting on the broken surfaces. The ivory was for the window wall, always the darkest in a room, and for the wall behind the desks. The light green was for the wall facing the desks and the wall on their right.

In front of the desks, the light green was to be a color of repose for eyes raised from paper work. Since interview chairs are almost invariably placed on the right of a desk, there was to be the same soft color behind the interviewer, so that the interviewer's eyes would be resting while he talked. The ivory



CLEAN, BRIGHT CEILINGS AND WALLS. IMPROVED SEE-ABILITY. A DEFINITE STEP TOWARD GREATER PRODUCTIVITY

walls were to throw the light on the desks, while the soft green on the opposite walls killed glare. We were luring light in from one direction and diffusing it in another.

The first executive reaction to a sample job of this color scheme on a 20-foot square bay was thumbs down. But, confident of the final reaction, we persuaded management to let us complete the job as outlined, on the basis that, if after 30 days they disliked it, we would repaint to any desired color without charge. At the end of the trial period we were not asked to repaint. Moreover, the same color scheme was ordered at the next renovation.

Color can also be part of the answer for an employer who finds it difficult to find and keep help. During the war a cracker manufacturing plant in Detroit was troubled by a rapid worker turnover, especially among the girls, as were so many industries. We gave management color-thinking in the factory and they went for it. When it came to the cafeteria, they were ready to listen to our suggestion that it be done over with fancy nightclub effects, our theory being that recreation areas should give workers a complete change, so that they go back to their desks refreshed.

But management balked when we suggested pink, rose, and yellow for the main office, instead of conventional greens. It was a fight to put it over, but we did. We worked among girls who had been reporting to their desks wearing middy blouses, sweaters, and bobby socks. Within a week after we'd moved out they were coming to work dressed up, and the plant discovered that it was having no difficulty in getting and keeping its girl employees.

More Color, More Light

Sensible use of color utilizes wasted light. This was demonstrated in painting two large work-areas, each about 300x1200 feet and well-windowed, in an airplane plant on the eastern seaboard. Neither room had a partition in it. Each rose to 20 feet, where hung the maze of beams, girders, pipes, and everything else that goes into an industrial plant. The ceiling and its maze were painted in a soft light green; the walls in ivory. The resultant diffusion gave so much more light at working levels that artificial lighting in both rooms was reduced.

Color can also make for better housekeeping. When dirt is easily visible, the inclination is to cause less of it, or clean up what is there. We did a color job on the equipment in a machine shop addition of a middle-west machine builder. Returning several months later to check its effectiveness, we were told the mechanics were almost pettish in protecting the equipment from handmarks and smudges that had to be wiped off.

METHODS OF APPLYING PAINT

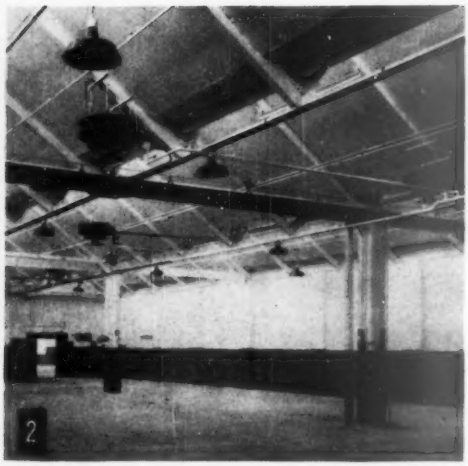
To spray or brush is the leading question in paint application. Here again experience has developed general principles as a guide.

Spray is the more economical where there is not much danger of contaminating the product or damaging equipment. Thus it can be used efficiently in warehouses and large open areas. It is not desirable on the exterior of any building, because of the danger of wind "carries"—and they are sometimes eccentric —which can mottle an autmobile parked as far as a mile away. Nor is spray desirable in highly cluttered areas, such as the spinning rooms of textile mills, tobacco manufacturing plants, and other plants with a high concentration of equipment and stock.

But the spray gun is indicated in areas that are inaccessible to the man with a brush, or for surfaces that require difficult brushing. Rough surfaces of concrete, cinder, concrete block, or brick work, a clutter of beams, or a high concentration of piping call for spray, even though there may be some additional cost for the protection of surrounding areas. The latter consideration, however, can sometimes favor the brush. Very often it costs as much to spray an area as it would to brush it, when the costs of protection against spray drift are considered.

Air currents play peculiar tricks with atomized paint particles. They whisk them through corridors, swirl them up elevator shafts, leaving the walls without a trace of their passage, and then bathe with paint some machinery or product floors away. That's why it is so important to have the spray work area completely sealed.

WHEN NOT TO SPRAY. Generally speaking, the spray gun job is not as good a job as the brush job. It doesn't apply as much paint as the brush. Moreover, a spray



BRUSH OR SPRAY FOR INTERIOR PAINTING?

1. Typical brush job; use of drop cloths overhead permits office operations to continue . . . 2. Spray is indicated; all the painters have to do is lay sheets on the floor and start painting . . . 3. Brush is better; cost of protecting machinery and equipment would offset economies from spraying; if spray were used, department would have to be shut down . . . 4. Spray; washfountains can be covered without difficulty

man may not clean the surface as thoroughly as the brush man will. The brush painter, keenly aware of the surface he's covering, stops when he sees something, knocks it off with his putty knife, or whisks it off with his duster. A spray man opens up his air trigger and blows the surface down before he pulls his paint trigger. He's moving fast; everything gets painted. Where it is a clean-up job with no particular dust or dirt, such as a warehouse area, spray has the advantage both in economy and speed. But for a really good clean-up job, it's the painter with the brush.

For the application of aluminum paint over large unbroken flat areas, as on sidewalls or oil tanks, spray is advisable to prevent lapping. A brush man paints 5 feet, stops to move his scaffold, and there you have a lap mark. That is partly true because aluminum paint is fast drying. But it is also true that you get no mark with the spray because a thinner coat is applied. The owner gets a nicer looking job but less protection.

Excellent protection and heat reflection can also be achieved on tanks with a light-colored lead-and-oil paint, brushed on. Whitewash is one of the best heat reflectors among paints, and some of the big oil companies are now using it on the tops of their tanks where the highest temperatures develop. The metal is given a rust-preventive paint first. Then the top is whitewashed once or twice a year. However, whitewash looks messy when it starts to break loose.

4 HOW TO PROTECT PRODUCT, EQUIPMENT, PAINTERS

PRODUCT. Protection of the product is a relatively simple problem when it is packaged and nonabsorbent. Drop sheets will do it.

It's another question when the product is unpackaged food, such as biscuits, or an absorbent material, such as tobacco. Drop sheets prevent direct contamination by paint, but there is another contamination more difficult to control—odor. The source is turpentine. Many persons, particularly women and girls, are made uncomfortable, in some cases ill, by long subjection to its odor. But in the past several years there has been a remedial answer—the masking agents developed by chemical companies. The one we use was the result of an experimental search we had to make because of our work in many food and tobacco plants.

Our masking agent lends turpentine the appetizing fragrance of vanilla cake. If any of it permeates food, it is undetectable; if it gets into tobacco, it is unobjectionable. We use very little—a fraction of an ounce to a gallon of paint. There are no hazards to its use, and it does not affect the finished paint job.

But it must be employed skillfully. It has a tendency to linger and sour. Its adaptability to a given product must be studied carefully. The same amount is not applicable in a tobacco plant as in a bakery or dairy. Test areas are painted to determine the proper quantity. It appears to be an odor that stimulates the appetite, particularly among girls and women. If too much is used in a plant, the employees get hungry and stampede to the food dispenser or cafeteria. So we use it judiciously.

EQUIPMENT. The drop sheet is the mainstay of the protective system for bulk product and equipment. When delicate machinery is to be protected, wrap it with paper before covering it with a drop sheet; drop sheets are heavy and grow progressively dirtier during a job, so it is necessary to guard against damage.

More often than not, the machinery cannot be directly covered because production is to continue while painting progresses. In such cases, drop sheets must be strung right under the girders. Then arises the question of what type and size. For brush painting, the sheets may be overlapped, but not so if absolute protection is required during a spray job. Air flows through the cracks, and a draft may carry the spray anywhere. Such a factor entered into our recent decision to pull up by block and fall a drop sheet fully 60x200 feet on an underceiling spray job with which we could take no chance of draft.

Many man-hours can be saved and much interference with manufacturing operations avoided if surfaces are well cleaned in advance of painting, and if the cleaning and painting of each area are scheduled so as to require but one placement of drop sheets. Dirt must be carefully worked into the drop sheets so that it does not fly around or allow particles to get into the product or eyes below.

PAINTERS. Never take safety on a painting job for granted. Fundamental in the premise that before undertaking the job management should know that its own insurance or the contractor's insurance (if a contractor is doing the job) is adequate and in order. Insurance safety engineers should be called in on every major job before it is started. The dangers of industrial painting range a wide gamut, from the scaffolding to the oily rag, and from the flash fire to the stepladder.

Curiously, the simple stepladder leads all the rest

HOW TO USE A STRAIGHT LADDER

RIGHT. Horizontal distance from foot of ladder to wall is about one-third the altitude. Painter doesn't over-reach. Safety shoes on ladder

WRONG. Every painter knows he must be careful on high, dangerous jobs. But put him on a ladder a few feet above the floor and watch him get careless

in trouble. It is a piece of equipment everyone thinks he can handle safely, yet insurance records show that falls from stepladders are among the most numerous on industrial painting jobs.

Painters usually are not afraid of high, dangerous jobs, because they are aware of the dangers and see to it that safety rules are enforced. But put a painter on a ladder 3 to 6 feet above the ground and he grows careless, even contemptuous. No one should ever work from the top rung of a stepladder or even from the rung below it. A painter needs that margin of safety to maintain his equilibrium, braced against the ladder, and that of the ladder, too, should it be swayed. Frequently the men try to make the more easily handled 6-foot stepladder do where an 8- or 10-foot ladder should be used. They go to the top of the 6-footer instead of using a higher ladder. And often they don't climb down.

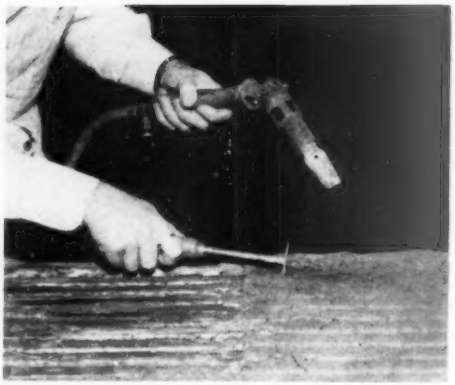
If that sounds like overemphasis of the trivial, a chemical corporation that has one of the best safety records in the United States does not think so! A worker in any of its many plants is not permitted to mount a stepladder without having another worker hold it. If a straight ladder is being used, there must be two men holding it.

In the use of a straight ladder, the major rule is that the distance of the base of the ladder from the vertical section being painted should be equal to one-third the altitude to which the ladder is raised. If there is not a man to hold a straight ladder, it should be tied in with a safety rope. This is particularly necessary on a smooth concrete floor.

HOW TO USE A STEPLADDER

RIGHT WAY. Ladder tall enough so painter does not have to climb too near top. Knees are braced against steps to give support

WRONG WAY. Watch that paint pot. Ladder much too short. Painter can't brace himself. Lots of waste motion



CLEAN SCAFFOLDS are safe scaffolds. Gas burner and scraper speed removal of accumulated paint

SCAFFOLD HAZARDS. The rigging of scaffolding is no work for novices. This is true in the interest not only of the safety of those who mount it, but also of the innocent pedestrian or worker below.

Through the years we have developed fundamental rules for the handling of scaffolding and the protection of the painters once they are on it. There is periodic inspection of scaffolding by a carpenter. He is on guard against dry rot in the ladders, against the insidious deterioration that drops a rung beneath a man's foot, and against cracks and shakes in the planking. It is his job to repair or discard. A piece in constant service is inspected more frequently than one used only occasionally. Each piece is marked for a constant record of the frequency and nature of its use. Whether a piece is exposed for a long time to heat or chemicals is a determining factor in how long it can be kept in service.

Planks used on work of any height are kept clean. Accumulated paint is burned or scraped off so that the planks do not get too heavy, slippery, or knobby. Clean planks make for safety in footing and handling.

Scaffolding rope is never reused after it has been around acid. Swing falls are reversed every year to promote even wear, and used only two years before discard. Blocks are kept properly oiled. Metal is tested against fatigue and for continued ability to sustain the load for which it was designed. Rope is kept off the floor to protect it from rats, and is suspended in coils in a place open to air circulation to prevent rotting.

VENTILATION. Once scaffolding is up we ascertain whether it is safe to climb. But what are the men climbing into? It is not generally realized that the higher the ceiling from the floor, the higher the temperature will be under that ceiling. For instance, in an ordinary machine shop, where the floor temperature might be 80 degrees, close under a 50-foot ceiling it may be 110 degrees.

There must be proper ceiling ventilation before men go up high to paint. Heat and paint fumes, when mixed, create a toxic condition that is not only a jeopardy to the painters, but also to the men below.

If the men are wearing respirators or goggles in a spraying operation, lifelines are strung. A man with fogged goggles and no guide rope is apt to step off the edge of a scaffold into space.

A man painting from a plank should never be allowed to reach beyond its edge. If the plank is 22 feet long, he has a 22-ft. painting stretch and no more. He must not hang to the edge and reach out an extra 2 feet, simply to avoid moving the plank and rigging. That extra stretch unbalances the scaffold. Most of the time the painter gets away with it. Occasionally he doesn't.

PROTECTIVE CLOTHING. Gas masks and goggles are as much a part of the industrial painter's equipment as the brush and pot. Put men inside a tank who are using one of the vinyl resin paints with some of the acetones for vehicles and thinners, and they are subjected to lung-searing fumes. They couldn't work without masks, no matter how many extra ventilating fans were turned on them.

There are painting jobs where the men must wear both goggles and gas masks. We know of one in an acid manufacturing department where scale and rust has to be chipped. Each flying particle contains a bit of the acid that eyes must be protected against, and high humidity creates fumes that require the use of gas masks for safety.

EXPLOSIONS AND FIRES. When the danger of flash fires or gas explosions exists, then the industrial painter must tread most circumspectly. There is a constant danger of dust explosion wherever you have a high concentration of dust in conjunction with dry conditions. It lurks in the thick accumulations of dust atop ducts and pipes high in the ceiling. Painters must take great care to avoid the sparking that sets off a flash. Then wood-handled dust brooms are used. In cases of yet greater danger, as around a plant in which sulphur dust is present, nonsparking tools, scrapers, hammers, and wire brushes are required. They are made of monel metal or beryllium copper and are nonsparking, nonmagnetic, and noncorrosive. Always employ such tools in a chemical plant, or where there is illuminating or natural gas leakage, or gasoline fumes, or any such hazard.

Another highly explosive dust is that of tobacco. Spread in a thin film on a dry surface, it is dangerous; just a spark will set off a flash fire. Unless the dust is highly concentrated, there is not much danger from it when it is suspended in the air. In combustible situations like these it is important to watch the painter's clothing. Hobnailed shoes are taboo. One of the nail heads striking steel might create a spark. To make sure our men don't have steel in their shoes, we insist on sewed leather or rubber soles.

Compressors and other motor equipment should be constantly serviced to make certain they are not becoming fire hazards. The most common hazard on painting jobs is, of course, the oily paint rag, holding the constant threat of spontaneous combustion. Put it out of the building or in a sealed container at the close of every working period. For the same reason, never stack drop sheets in large piles unless the paint on them is dry. And keep thinners and paints in sealed containers away from open flames.

5 WHO IS TO DO THE PAINTING

BY NOW IT MUST BE EVIDENT that industrial painting needs competent administration and good supervision for best results. It also needs skilled workmen. Giving a man a can of paint and a brush doesn't make him a good painter. Time and materials are too expensive to waste in such misapplication.

No large plant should be without its skilled maintenance painters. There are always retouch, clean-up, and emergency jobs coming up. It is the major periodic jobs that raise the question of how to handle them. Usually more skilled manpower is needed than is currently available. The answer boils down to a choice of keeping a large force of painters steadily on the payroll, augmenting a smaller, regular painting force temporarily, or calling in an outside contractor. There are pitfalls to be avoided in all three methods.

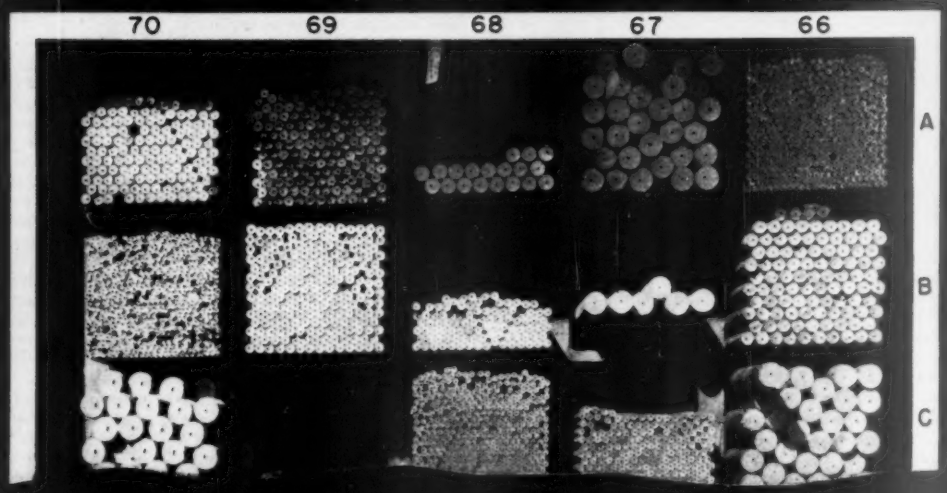
To keep a large maintenance painting force busy, management frequently has to create work, go over some area that wasn't quite in need of paint, and thereby increase maintenance costs. Union seniority rules on firings and layoffs often make prohibitive the cost of keeping a maintenance force equal to the larger jobs.

As a compromise, normal maintenance painting staffs are sometimes built up from layoffs in production forces, rather than going outside for skilled painters. For example, a machinist whose bench job is abolished may, because of seniority, have to be put on as a painter, despite the fact that he knows nothing about the work. The inferior results from unskilled men, not to mention the unfamiliar hazards to which such men are often exposed, ought to be apparent.

Should the owner decide in favor of calling in a contractor, he may think that because he goes out into the competitive market and gets a firm quotation he knows where he is heading, cost-wise. But on the straight "firm price" contract, the owner often pays more than he should for the job. Also, the contractor often wants to get out of the job too quickly and may skimp on the job.

On the straight "cost-plus" form of contract, there is no incentive for the contractor to get the job done as quickly and economically as possible. For the unethical contractor, quite the opposite is true: he finds excuses for dragging the job out. The more it costs, the more he makes out of it.

A better answer seems to be in between these extremes, as provided by the "guaranteed cost" form of contract. Here the contractor tells the owner that the job will not cost him more than a certain amount. If it runs over, the contractor takes the licking. If it is lower, the owner gets the saving. No contractor wants to take a licking, nor does he want to bid himself out of reasonably profitable operations—competitive bids will demonstrate how reasonable—and sometimes the owner stands to get a substantial saving under a guaranteed cost contract.



1 PHOTOGRAPH used for inventorying steel bar and rod stock. Clerk counts stock in each bin, puts an ink dot on the end, and enters the total count on the inventory checking card

Taking Inventory With a Camera

It takes less time. Steel can be moved into production as soon as photograph is printed. Experienced office people, not steel handlers, do the counting

GEORGE CARLSON • ASSISTANT CONTROLLER, PLOMB TOOL COMPANY, INC., LOS ANGELES

A CAMERA MAN is busy at Plomb Tool Company at inventory time each year. Steel bar and rod stock for the manufacture of hand tools is inventoried with help of a camera. This system has enabled the company to save valuable production time previously lost yearly through shutdown for inventory.

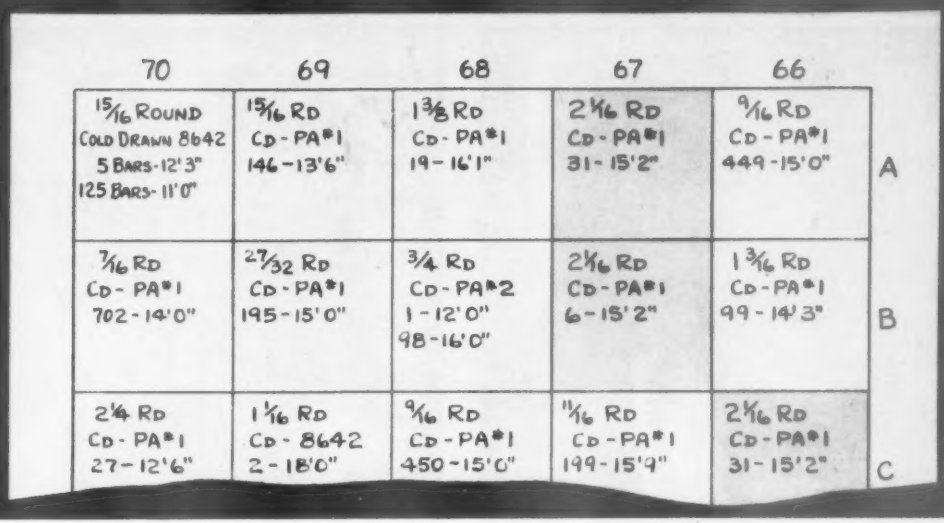
Steel alloy stock (cold-drawn) is stored in standardized, horizontal steel racks. Each year at inventory time stock is photographed in these storage racks. Photographs are enlarged sufficiently to enable office personnel to count stock accurately. As the contents of each bin are counted from the photograph, the clerk merely enters the amount on an inventory checking card. Spaces on the checking card correspond to bin in the rack. (See Figures 1 and 2.) As clerk counts stock shown in the photograph she places an ink dot on the bar's end to indicate the piece has been counted.

Dimensions and descriptions of stock are obtained from a hook chart, located on a wall in the steel department office. Each hook represents a bin. A small card is hung on it to identify the contents of the corresponding bin. As new shipments of steel arrive and are placed in racks, cards are removed from hooks and replaced by new ones with proper descriptions. These hook-cards do not, of course, show weight or the number of bars in each bin, as this would delay considerably the unloading of cars.

Length of bars cannot be ascertained from the photograph. As racks are being prepared for inventory, the foreman, assisted by a helper, checks each bin to determine length of bars by means of a long calibrated measuring stick. Bar lengths are then recorded on the checking card. Bars of odd length are reported in the total count.

The clerk performing the count from the photograph merely counts the total number of bars in the bin and subtracts from that total the number of odd-length bars already entered on the checking card. The remainder is then entered as standard length. (See row 70-A in figure 2.) The foreman noted 5 bars offsize. They measured 12 feet 3 inches long. The clerk counted a total of 130 bars in the rack photographs, subtracted 5 from the total to get 125 bars 11 feet long, the standard length.

The only exceptions to this method are stock of extremely small diameters or that which is too uneven to stack properly. In these cases, stock is manually counted.



70	69	68	67	66	
15/16 ROUND COLD DRAWN 8642 5 BARS-12'3" 125 BARS-11'0"	15/16 RD CD-PA#1 146-13'6"	1 3/8 RD CD-PA#1 19-16'1"	2 1/16 RD CD-PA#1 31-15'2"	9/16 RD CD-PA#1 449-15'0"	A
7/16 RD CD-PA#1 702-14'0"	27/32 RD CD-PA#1 195-15'0"	3/4 RD CD-PA#2 1-12'0" 98-16'0"	2 1/16 RD CD-PA#1 6-15'2"	1 3/16 RD CD-PA#1 99-14'3"	B
2 1/4 RD CD-PA#1 27-12'6"	1 1/16 RD CD-8642 2-18'0"	9/16 RD CD-PA#1 450-15'0"	11/16 RD CD-PA#1 199-15'9"	2 1/16 RD CD-PA#1 31-15'2"	C

2 **INVENTORY CHECKING CARD. Spaces correspond to bins in storage rack. Type of stock in each bin is noted on card by foreman. Clerk completes count of stock from photograph**

Unpredictable mill schedules made it quite impossible to allocate specific racks for each steel size. Therefore, steel of the same description may be located in various sections of several racks. A card was designed to serve as a recapitulation of all stock of like description, irrespective of location. (See Figure 3.) As contents of bins (Figure 2) are noted on the steel card (Figure 3) the item is checked as evidence of posting. When all entries have been made, the total number of feet is determined. This figure is multiplied by pounds per foot to determine total weight. Cost per hundred pounds is known, so a total cost figure is easily arrived at. Steel cards may serve as inventory records or necessary information can be typed on regular inventory sheets.

Plomb Tool Company feels some very definite advantages accrue through use of this method. In addition to a speedier inventory, it permits movement of steel into production as soon as the photograph is printed. Steel does not have to be removed from racks for counting. Experienced office personnel rather than steel handlers are used to count, so the results are more accurate.

Auditors find checking very convenient. Inventory is "frozen" on the photograph for future auditing.

STEEL CARD

2-1/16" Rd. — SIZE
C.D. PA #1 — SECTION / DESCRIPTION

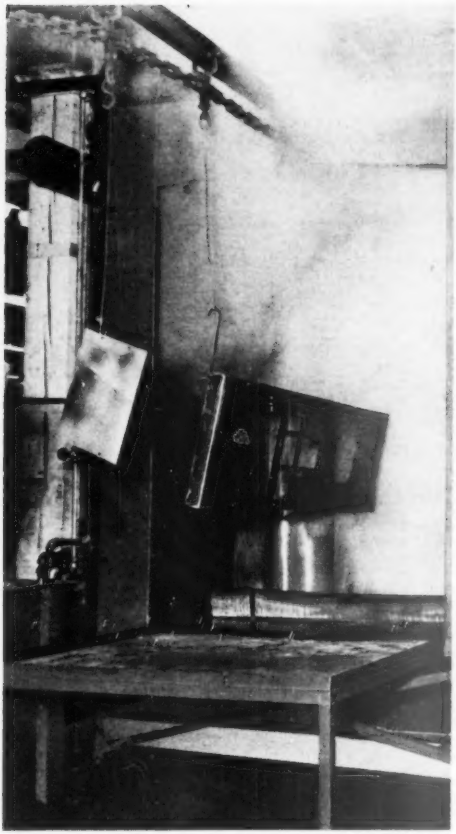
51,163 — TOTAL WEIGHT
7.49 — COST PER CWT.
3,832.11 — TOTAL COST

11.3595 — WEIGHT PER FOOT
F.D. — PRICED BY
L.W.+W.T. — EXT. CHECKED

LOCATION	NO. OF BARS	BAR LENGTH	TOTAL FEET	WEIGHT
63G	29	15'	435	
64G	29	15'	435	
65F	29	15'	435	
65G	30	15'	450	
66C	31	15'-2"	470	
66E	1	14'	14	
67A	7	15'	105	
67B	31	15'-2"	470	
			4504	51,163

3 **STEEL INVENTORY CARD serves as recapitulation for stock of single size and description. Data are assembled on this card from one or more inventory checking cards, depending upon location of stock**

CLEANING booths house five sets of sprays above tanks of circulating liquid for desired processes



PAINTING is done in single booth; parts move through on by-pass conveyor for additional coats

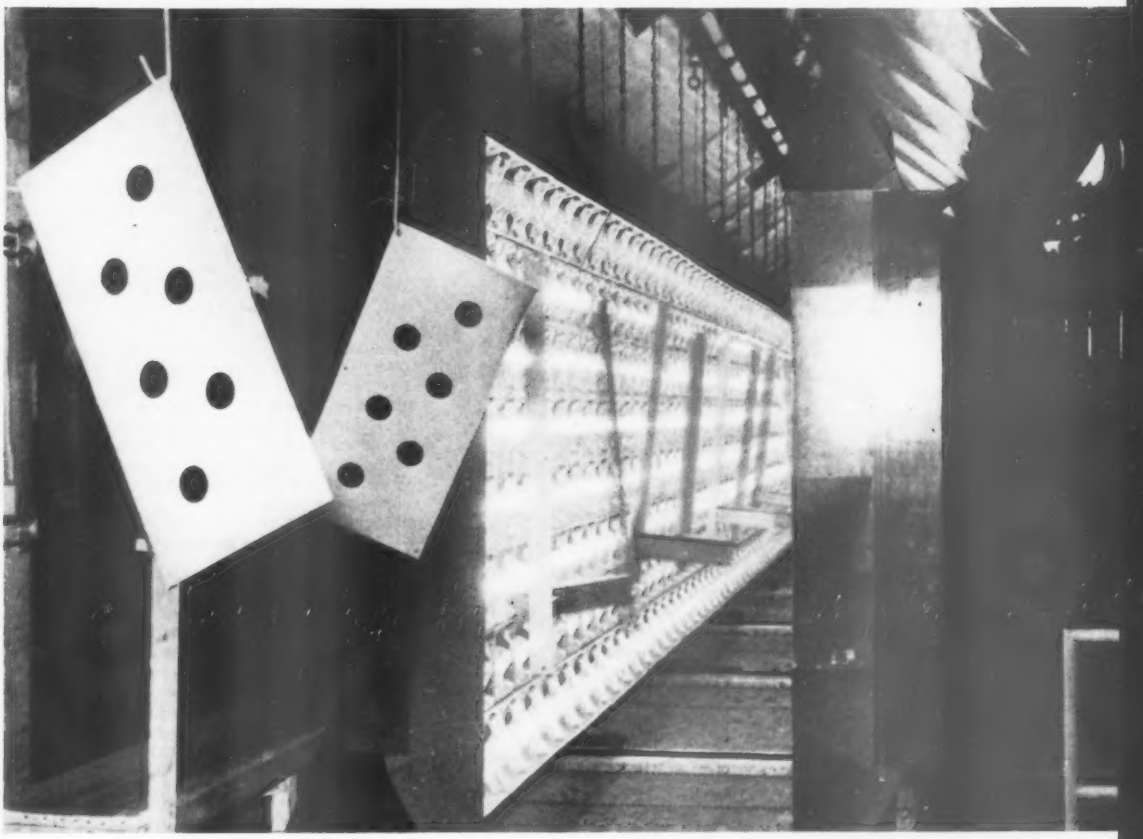
Flexible Cleaning...Painting...and

Many types of finishes for a great variety of parts in different shapes and sizes can be produced efficiently with this versatile, single-conveyor set-up

A COMBINED CLEANING and painting set-up for extremely flexible handling of switchgear and control parts has greatly simplified the process of providing various finish requirements at Allis-Chalmers, Milwaukee. Instead of a number of spray booths and drying tunnels, which would normally be used in this continuous process, only one spray booth and one drying tunnel are needed, and parts are carried by overhead chain conveyor through the same equipment the number of times required for each particular finish.

Cleaning is done in a long tunnel equipped with five sets of sprays. Under each spray system is a heated tank containing the circulating liquid, which is drawn from the bottom of the tank and returns through floor openings in the tunnel. Impurities that collect float off the top surface of the liquid over weirs.

The first spray is an emulsion cleaner containing alkali, primarily to remove grease and oil accumulated during machining opera-



DRYING area is flanked by sectional banks of infra-red lamps. By moving sections backward or forward, it is possible to regulate intensity of drying heat as well as length of time of exposure

Drying on One Conveyor

tions; the second is a hot water rinse. The third spray is an acid wash which etches the steel to provide a base for paint adhesion. The fourth stage is a cold water rinse, and the fifth is a phosphate sealer.

After leaving the spray tanks, the parts are carried to a down-draft paint spray booth and then through a 60-ft. infra-red tunnel. Filtered air is introduced into the booth and drawn off through a spray washer to remove paint before being discharged.

To accommodate parts of different bulk, the entrance to the spray sections are partially shielded by flexible curtains pushed out of the way by the moving work.

In the drying or infra-red section, the banks of light are adjustable in location. For small parts, only a few banks may be lighted and these are placed close to each side of the work. For larger sections, the banks may be separated as required and additional banks used. Finishes may be baked or the lights may be used only for accelerating the drying.

Different products require different paints and a different number of coats. Some items require only priming for stores until they are used on a job. Consequently, since only one paint spray booth is used, a second carrier chain, by-passing the cleaning tank, is used for repeated trips through the painting booth and drying tunnel.

The flexibility of the installation allows proper handling of any part, from a large bulky element to small stampings, with remarkably efficient use of facilities.

When You Apply Capacitors to Induction Motors

Z. NERI • CAPACITOR ENGINEER, WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH, PA.

DIRECT CONNECTION of shunt capacitors to induction motors will result in trouble-free operation if the capacitor size is properly chosen. However, if the capacitor used on a given motor is too large, damaging overvoltages may result when the motor-capacitor combination is disconnected from the line, because under these conditions the motor may become a generator, with excitation furnished by the capacitor while the motor is still rotating. In addition, high transient torques capable of damaging the motor shaft or coupling can occur if the motor is placed back on the line while still rotating and generating.

Widely fluctuating loads usually necessitate switching of the capacitor banks automatically to avoid excessive voltage rise during light-load periods. Often the simplest way to do this, notwithstanding the difficulties mentioned, is to connect capacitors directly to the motor terminals, to permit switching of the motor and capacitor as a unit. This method not only varies capacitor kvar. simultaneously with changes in motor loads, but also brings about a saving in switching equipment, since a separate switch is not required for the capacitors.

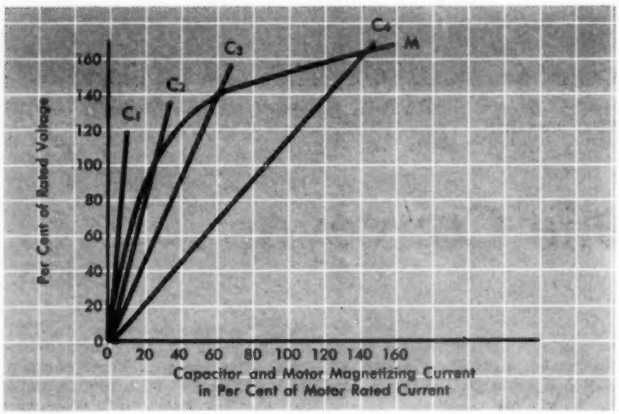


FIGURE 1

OVERVOLTAGES DUE TO EXCESSIVE CAPACITANCE

An induction motor will operate as an induction generator if a capacitor that produces sufficient kvar. is connected to its terminals, to supply the motor magnetizing current. Figure 1 shows the no-load saturation curve of a typical induction motor and the volt-ampere characteristics at rated frequency of four capacitors of various sizes, C_1, C_2, C_3, and C_4. The voltage of self-excitation for a given capacitor and motor combination is given by the intersection of the capacitor volt-ampere curve and the motor's magnetization curve.

It is evident from Figure 1 that there is a critical capacitive reactance, similar to the critical resistance in the field of a d.c. generator, which must be less than a certain value in order for the induction motor acting as a generator to build up. Thus for a given motor no self-magnetization will be experienced with a direct-connected capacitor below a certain rating in kvar. If the capacitor volt-ampere curve does not cross the motor magnetization curve there can be no voltage of self-excitation. This condition is represented in Figure 1 by capacitor C_1. Self-excitation will occur only if the capacitive reactance is equal to or less than the inductive reactance of the motor.

Voltage May Be High

The capacitor of curve C_1 is approximately the size required to correct the no-load power factor of the motor to unity. Note that the voltage of self-excitation in this case is 100 per cent, which was to be expected. Capacitor C_2 is approximately large enough to correct the full-load power factor of the motor to 100 per cent, and the voltage generated when this motor is disconnected from the line will rise to 140 per cent of its rated value.

These values will vary widely for different motors and may be much higher.

Quick Build Up, Quick Decay

Graphical determination of the voltage of self-excitation, as outlined here, assumes that the motor will remain near rated speed for sufficient time after the switch is opened to permit the generated voltage to build up to full magnitude. The rate at which the voltage builds up is usually extremely rapid, so that the maximum voltage generated is very nearly that determined by this method. It may be measured by placing a voltmeter across the motor terminals when it is disconnected from the line. A motor usually slows down very quickly when de-energized and the voltage generated usually collapses in a few seconds. In some cases, however, where the motor is connected to a high-inertia load the voltage may be sustained for several minutes.

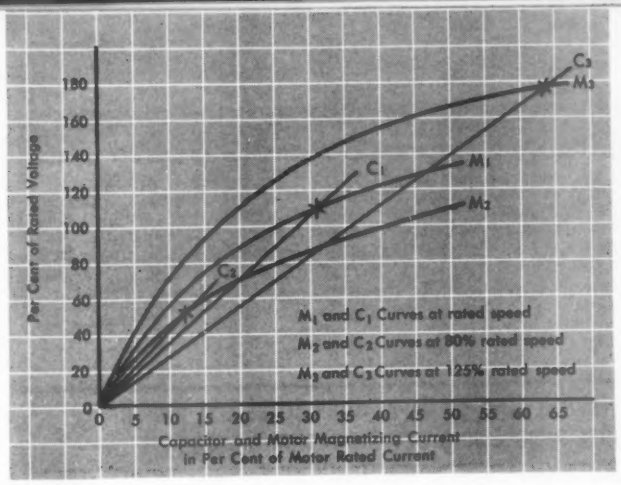


FIGURE 2

GENERATED VOLTAGE AT OTHER SPEEDS OF MOTOR ROTATION

In applying a capacitor to the terminals of an induction motor which may at times be forced to run at speeds greater than synchronous by the type of load applied, careful consideration should be given to the size of the capacitor. If the motor becomes disconnected from the line while running above its rated speed, the high voltages of self-excitation would appear capable either of damaging the motor or the capacitor, unless the latter has been chosen correctly for the application in question.

Figure 2 shows the general method employed in calculating the voltage of self-excitation generated at any speed. Here M_1 is the no-load saturation curve of a typical motor and C_1 is so chosen that 110 per cent voltage will be generated when the motor is disconnected from the line while it is running at its normal rated speed.

When Speed Is Not Normal

Assume that it is desired to know the voltage generated when the motor speed drops to 80 per cent of rated. The new motor saturation curve, M_2, will be dropped to 80 per cent of its original value, since the generated voltage is directly proportional to the speed. The slope of the capacitor volt-ampere characteristic, on the other hand, will be increased to 1.25 times the original value. The new voltage of self-excitation is given by the intersection of curves C_2 and M_2 and is found to be 53 per cent. If the speed is reduced much beyond this point, it can be seen that the generated voltage will completely collapse.

Conversely, if the motor is driven by some external means at 125 per cent of rated speed the magnetization curve will be raised to 1.25 times the original value and the slope of the capacitor curve decreased to 0.80 times that of C_1. The generated voltage would then be read from the intersection of curves M_3 and C_3 and found to be 175 per cent of rated.

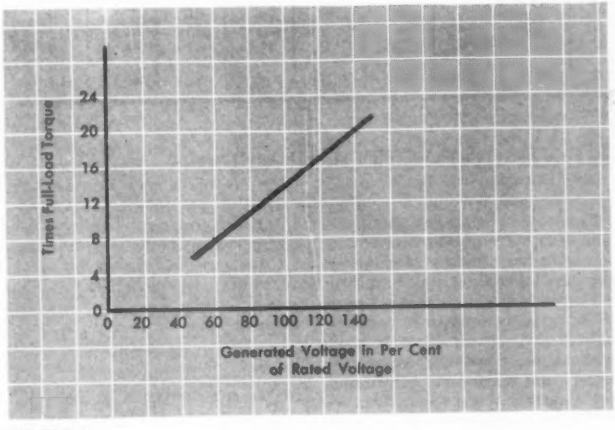


FIGURE 3

HIGH TORQUE DUE TO EXCESSIVE CAPACITANCE

Even though the capacitor has been chosen properly from the standpoint of avoiding overvoltages, it may still be large enough to produce excessive torques in certain motor applications where high-inertia loads are involved or where open-transition starting is used.

High stresses may be applied to the shaft and couplings either when the motor is transferred to the line from the reduced voltage tap of an autotransformer-type starter, or when the motor is disconnected from the line and re-energized while still rotating and generating a voltage of self-excitation.

When Torque Is Large

The electrical torque produced will be large only if the generated voltage is appreciable and out of phase with the line voltage. This condition may be compared to connecting a synchronous generator to a system with which it is out of phase. The peak value of electrical torque is determined primarily by the magnitudes of the line and motor voltages, the angle between them, and the impedance of the motor.

Figure 3 shows the maximum electrical torque that can be expected as a function of the motor voltage of self-excitation. This curve is drawn for one specific motor after making simplifying assumptions, but will be found accurate enough to make rough estimates on many motors.

Peak transient mechanical torque

should not be permitted to exceed about six times normal, if damage to the shaft and coupling is to be prevented. The maximum mechanical torque transferred by the shaft will always be less than the electrical torque as found from Figure 3, and will be proportional to the load inertia as compared to the total inertia of the motor plus load. Or,

$$T_m = \frac{J_l}{J_l + J_m} T$$ where,

T_m = Mechanical torque
J_l = Load inertia
J_m = Motor inertia
T = Electrical torque from Curve 3

It is evident from this equation that if the load inertia is small in comparison to the motor inertia, very little torque will be transmitted to the shaft, and the electrical torque will be absorbed by the motor inertia and merely result in the momentary deceleration or acceleration of the motor. If, on the other hand, the connected load has a high inertia, much of the electrical torque will be transmitted by the shaft as mechanical torque and may cause dangerous stresses.

MAXIMUM RECOMMENDED RATING OF CAPACITORS TO BE USED WITH OPEN-TYPE, THREE-PHASE, 60-CYCLE INDUCTION MOTORS

MOTOR RATING, HP.	3600 RPM		1800 RPM		1200 RPM		900 RPM		720 RPM		600 RPM	
	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.	MAX. CAPACITOR RATING, KVAR.	REDUCTION IN LINE CURRENT, PER CENT.
10	2.5	9	4	11	4	12	5	17	5	23	7.5	28
15	2.5	9	5	11	5	11	7.5	16	7.5	21	10	26
20	5	9	5	10	5	11	7.5	15	10	20	12.5	24
25	5	9	7.5	10	7.5	10	10	14	10	19	15	22
30	7.5	9	10	9	10	10	10	13	12.5	18	15	21
40	10	9	10	9	10	10	12.5	12	15	16	17.5	19
50	12.5	9	12.5	9	12.5	9	15	12	20	15	22.5	17
60	15	9	15	8	15	9	17.5	11	22.5	14	25	16
75	17.5	9	17.5	8	17.5	8	20	11	27.5	13	30	15
100	22.5	9	22.5	8	22.5	8	25	10	35	12	37.5	14
125	25	9	27.5	8	27.5	8	30	9	40	11	47.5	13
150	32.5	9	35	8	35	8	37.5	9	47.5	11	55	13
200	42.5	9	42.5	8	42.5	8	45	9	60	10	67.5	12

RECOMMENDED CAPACITOR RATINGS

The table shows the maximum recommended capacitor ratings to be used with various sizes of motors so that excessive overvoltages will not occur when the motor and capacitor are switched as a unit. The overvoltage due to self-excitation will be held within the maximum permissible value of 110 percent if the capacitor ratings are chosen from this table. The transient torque also will be held within reasonable limits unless the application involves a manually operated transformer starter and high load inertia.

Under these conditions it is desirable to make a detailed study of the transient torque, if the voltage of self-excitation is greater than approximately 50 per cent.

The capacitor ratings given in the table are sufficient to correct the no-load power factors of their respective motors to approximately 100 per cent and the full-load power factor to higher than 95 per cent, which usually is sufficient for most applications. These capacitor ratings do not necessarily correspond to standard ratings; where there is a difference, the next lower standard rating should be used.

When it is necessary to use a capacitor larger than the sizes indicated in the table, it can be done under the following conditions:

(a) If the application is one where the motor is not likely to be reconnected to the circuit before it comes to rest.

(b) If open-transition starting is not used.

(c) If the saturation curve for the motor is available and the self-excitation voltage is calculated and found to be within safe limits with the capacitor proposed.

(d) If self-excitation voltage is measured on the particular motor and capacitor and is within safe limits.

In all other instances the capacitor should be connected to the line ahead of the motor switch, or if connected directly to the motor, the capacitor should be provided with its own electrically operated switch, which in turn may be controlled by the motor switch.

ONE-HAND GRASP VALUES

Allows parts to slide[1] in:	Very Small One dimension less than 1/16"	Small Not over 1/2" X 2" X 2"	Medium 1" X 3" X 3"
No planes	Interlocking Parts — Use Individual Analysis[2]		
1 plane	0.0040	0.0052	0.0028
2 planes	.0032	.0044	.0024
3 planes	.0016	.0036	.0016

▶ Add 0.0008 to value for oily pieces, or oily fingers.

▶ For pieces with rounded contours ⌀ O, use 1/3 of overall dimension.

1. To determine number of slide planes, parts must be placed at random on a flat surface, with depth of pile more than two pieces deep. If parts can be picked out of pile only in one direction, use one plane; two directions, two planes; etc. Part must be grasped and freely removed without using a finger motion to move adjacent pieces. Grasps are random and blind, and are only to be used with hard pieces.

2. If parts can lock on one or more surfaces, but have other surfaces which slide freely, use ratio of

$$\frac{\text{limited surfaces}}{\text{total surfaces}} = \text{percentage basis of occurrence.}$$

"One-Hand Grasp" Times Improve Our Work Factor Analysis

HOWARD FLICKER • PRODUCTION SUPERINTENDENT, IDEAL CLAMP MANUFACTURING COMPANY, INC., BROOKLYN

WORK FACTOR ANALYSIS breaks down each motion and its attributes so that time values can be determined for any set of conditions. But we learned when we tried to use this method at Ideal that a large percentage of each analysis is the time it takes to *grasp* an object and to secure manual control over it prior to pre-positioning or transporting it. Each grasp is not one motion, but a series of small motions, some with time values as low as 0.0004 parts of a minute.

Micromotion equipment, fundamentally the best method of getting these values, was too slow and expensive for our use. We therefore had to rely on the judgment of the person building up the analysis and hope that experience would give us a basis for comparative values which could be administered fairly.

Within limits, we were successful. The limiting factors were primarily the feeling that the time factors used for grasps could not be proved, and the amount of time required to analyze a grasp for a particular piece.

Analysis consisted of getting a group of pieces, placing them in a pile on a flat surface and experimenting to determine the motions required. Of course, this experimentation duplicated conditions in the plant as closely as possible, but conditions could not always be duplicated exactly. Analysis of the grasp elements as synthesized for some 85 different parts showed no apparent common denominator which could be used to establish a formula which would take the time factors for grasping out of the realm of judgment.

The next approach was to analyze the problem abstractly, without regard to any particular parts.

The factors which determine the degree of difficulty in securing control of a part are:

1. Size. Experience proved that pieces thinner than 1/16 inch tended to become difficult to handle —the curvature at the ends of the fingers caused them to slide over the part rather than grasp it. It then becomes necessary to either tilt and grasp or slide and grasp the part.

2. Slide planes. Projections or depressions in a part which create delay conditions are those which interlock with adjacent parts and do not allow a single piece to move free. This will occur on a percentage basis, with the ratio of limited surfaces to total surfaces determining the percentage of occurrence. Pieces of certain types, when placed in a random heap, will fall in certain patterns: For example, long, thin cylinders tend to fall with the long axes parallel to each other; flat plates tend to fall with the broad surface planes

parallel, and so forth. Where such a tendency exists, the piece cannot be grasped without some finger motion to move adjacent pieces away. The number of finger motions required to free the part from adjacent pieces will vary with the degree with which the near parts confine the piece wanted.

If the piece can move away from the other pieces only in one plane, required finger movements will be relatively many. If it can move away in two planes, fewer movements are required. If it can be moved in all three planes, a condition analagous to a single piece on a flat surface exists—all parts with the exception of very small ones can be grasped with a single finger motion. No values are computed for fully interlocking parts (for example, coil springs with open ends). Time required for grasping will vary and individual analysis is required.

3. Basic shapes. Types of contours will affect grasping time primarily when parts are so small that the fingers have a tendency to slide over them. It has been found that where a rounded or beveled edge is presented to the fingers the degree of grasp difficulty or time it presents is equal to a part one-third as large.

4. Surface condition. Where oil or grease is present, it may sometimes be necessary to go to two hand manipulations to separate the parts. Obviously, every effort should be made to avoid this condition. Light lubricants and coolants, however, cannot be avoided, and a special allowance is made to recognize this condition.

The table at the top of the preceding page (which we have checked against factor analysis) has been set up for rapid reference. It contains the values computed from the above derivations. With it, we believe, all elements of variation as a result of individual judgment are removed from work factor analysis.

Special Awards Stimulate Patentable Ideas

W. D. KENNEDY • VICE PRESIDENT AND GENERAL MANAGER
WRIGHT AERONAUTICAL CORPORATION
WOOD-RIDGE, N. J.

A NEW POLICY of substantial cash rewards for patentable ideas is paying off two ways at W.A.C. and other divisions of Curtiss-Wright Corporation. Employees are encouraged to develop and submit ideas for patent consideration. The company profits, in turn, from an accelerated flow of improvements in its products or in the methods, tools, or machines used in their manufacture, testing, or operation.

The "patent incentive plan," as it is called, is an added feature of the company's suggestion plan, with this chief difference: *All employees are eligible* to share in the benefits, except officers, directors, and consultants. It includes, for example, design and development engineers, who always are required by contract to submit all inventions to the company. These and other men formerly were exempted from awards in the suggestion plan unless their suggestion showed ingenuity, imagination, or development beyond reasonable expectancy, or related to subjects outside their assigned responsibility.

Benefits Already Observed

The patent plan became effective by an announcement late in June, 1948, but was made retroactive to January 15. During the first year there were 33 awards totaling $1050.

These payments may represent only the first of a series of payments to the award winners, depending upon the success of the application of each invention. An initial award of $25 is made to a sole inventor when the patent application is signed, *whether or not it is granted.* An added $75 follows if and when the patent is issued. Both these amounts are doubled and divided coequally if two or more men have worked jointly on the idea.

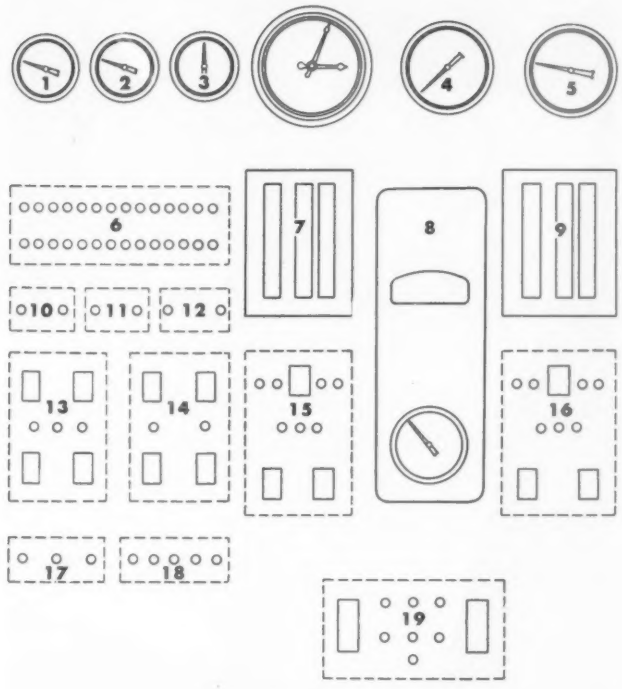
Although the company reserves the right to do as it sees fit with all patents assigned to it, the company has a continuing policy of granting licenses at fair and reasonable royalty rates. Or the company may sell the patent. In either case the inventor (or inventors) receives 20 per cent of the first $5,000, 10 per cent of the next $50,000, and 5 per cent of all over $55,000 of the proceeds.

The initial payments of $25 and $75 are made even if the inventor has left the company's employ. The subsequent payments, however, are made only to active employees, or those on leave-of-absence or retired under the company plan. If an inventor dies in the interim, payments will be made to his widow while she is living, or if not living, then to any minor children until they reach the age of twenty-one. Several awards already have gone to men no longer with the company.

Every Suggestion Considered

The rules for submitting ideas tie in with the regular suggestion plan. Emphasis is placed on the stimulation of ideas, leaving it to company experts to decide on the advisability of a patent application. Employees eligible to the suggestion plan continue to submit all ideas under that plan. All suggestions are automatically screened by the suggestion committee for patent possibilities. This is done under the supervision of the company's director of patents, who is a regular member of that committee. If the committee decides to file a patent application, the originator is asked to sign the application. No application is filed without such signature; it serves as a notice and guarantee of eligible benefits.

Employees exempted from the suggestion plan must fill out a special "Disclosure of Invention" form. If the contributor is an employee of the engineering department, he must clear the form through his division head in accordance with long-standing regulations on the subject. Other employes send applications directly to the patent department. Employees are always advised of the outcome of a suggestion.



LEGEND

1 Air conditioning water pressure
2 Domestic water supply
3 Air pressure
4 East boiler pressure
5 West boiler pressure
6 Alarm lights, with reset buttons, to indicate: (a) Failure of any one of seven air conditioning fans; (b) abnormal air pressure; (c) abnormal steam pressure; (d) failure of d.c. generator; (e) failure of a.c. main power line; (f) improper functioning of boiler; (g) failure of public address and plant telephone systems; (h) failure of sump pump
7 Underfire, overfire, and stack-draft indicator, for east boiler
8 CO_2 indicator and recorder
9 As 7, for west boiler
10 Remote speed control, auditorium fan
11 Indicator lights, alarm system
12 Indicator lights, to show when condensate is being pumped to boilers
13 Switches and lights for water pump and its operation-time measuring device
14 As 13, for air compressor
15 East boiler controls
16 West boiler controls
17 Indicator lights and switch for water booster pump
18 Plant blackout switches
19 Fuel controls for east and west boilers

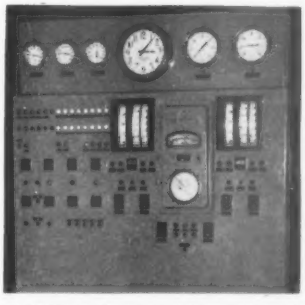
PANEL SHOWN IN PHOTOGRAPH BELOW IS REPRODUCED IN SCHEMATIC FORM TO INDICATE CONTROL FEATURES

Central Panel Spots Breakdowns

A CENTRAL CONTROL PANEL, located in the boiler room, supervises the operation of important equipment at Woodward Governor Company, Rockford, Ill. Gages, lights, and buzzer signals have been installed to warn the operator of trouble with supervised equipment practically anywhere in the building.

This control panel is designed to give immediate warning when there is failure of some essential equipment, so that steps can be taken promptly to correct the trouble. As will be seen from the illustrations, small indicating lamps signal when trouble occurs in equipment, some of which is located in remote parts of the plant. When the lights on the board are burning they indicate that the supervised equipment is working satisfactorily. If trouble occurs, the individual lights go off and a buzzer sounds.

This alarm system is actuated by: (1) Failure of any of the seven air conditioning fans, each of which has a photo-electric smoke detector and electrostatic air filter; (2) abnormal compressed air pressure; (3) abnormal steam pressure; (4) failure of the d.c. generator; (5) failure of the a.c. main power line; (6) improper functioning of the boilers; (7) failure of the plant public address and telephone system; (8) failure of the sump pump to operate properly.



FAILURE of essential equipment shows up on control panel

The schematic diagram (above) identifies the various lights and switches as they are located on the control board.

Since the installation of this central control panel, delays caused by trouble with equipment have been markedly reduced. Maintenance men now know immediately when and where trouble occurs.

Allison Quality Competition
Certificate of Merit
Presented to
of Department
Allison Division of General Motors
Corporation in recognition of your efforts
contributing to the success of your Depart-
ment in winning the Quality Competition
for the month of

THERE'S A CUP FOR THE DEPARTMENT . . . A CERTIFICATE FOR EACH MEMBER OF THE MONTH'S TOP DEPARTMENT

Monthly Competition Provides

W. G. GUTHRIE • WORKS MANAGER, ALLISON DIVISION, GENERAL MOTORS CORPORATION, INDIANAPOLIS

EVERYONE KNOWS that to produce quality products at reasonable prices requires cleanliness, orderliness, and efficiency. With that principle in mind, Allison Division developed an interdepartmental quality competition based on those factors.

The program, which has been in operation since 1941, has proved very successful. Designed to show each department how it stands in comparison with other departments, it has generated a healthy competitive spirit and raised the morale among the employees.

Dramatic evidence of the effectiveness of the program is to be found in the foreman's report to the supervisor of the quality competition, dated last May 28:

"My department has become quality-conscious since winning the award. . . . My expense material account is decreasing monthly, and our efficiency is climbing steadily.

"I feel that the quality competition has been largely responsible for this improvement . . . It is a very good incentive . . . gives the employee a goal to work for."

Nonproductive as well as all productive departments participate in the competition. A point system of scoring is used, with different weighting of the elements for productive and nonproductive departments. Handicaps are set up for small nonproductive departments and are based on number of employees, type of work, and floor area to compensate for problems that are prevalent in large productive departments.

Points are based on the following factors:

1. Good workmanship in productive departments from reports on quality output and loss of time due to scrap. (This information is received from the cost department.)

2. Good housekeeping, which includes cleanliness, orderliness, safe-

. . . A LAPEL PIN FOR THE WORKER

. . . A PERSONAL GIFT FOR EACH AND A PRIZE FOR THE DRAWING WINNER

. . . AND A COPY FOR EACH EMPLOYEE OF A PICTURE OF THE DEPARTMENT TAKEN AT THE PRESENTATION CEREMONY

Incentive for Better Work

ty hazards, and efficient use of working time. (Departments are rated twice monthly by a foreman chosen from a rotating roster to serve for a three-months' period.)

3. Expense and labor budget. (This report is received from the accounting department.)

4. Punctuality and absenteeism. (This report is received from the timekeeping department.)

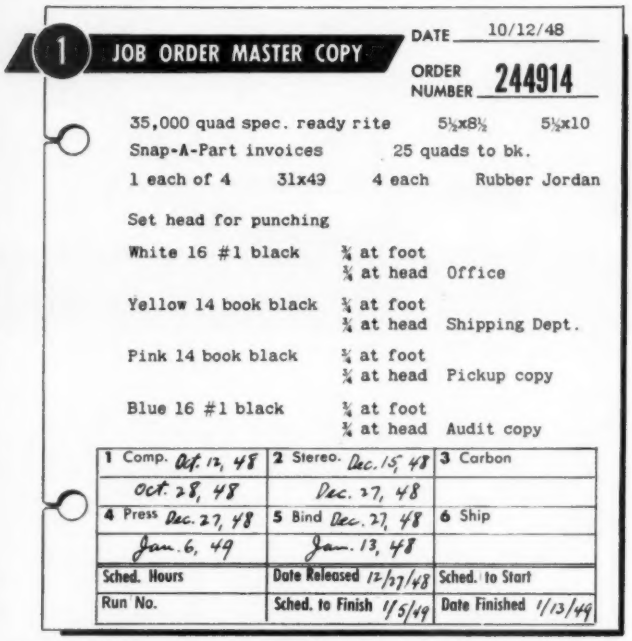
A certificate, a gold pin, a congratulatory letter from the manager, and a personal gift are presented to the foreman and each member of the winning department. Suitable gifts are given to the men, consisting of leather billfolds, electric clocks and lanterns, etc. For the women such items as compacts, costume jewlery, musical powder boxes, etc., are given.

In addition to the above a grand prize consisting of a radio-phonograph combination or some similar item is awarded and all employees in the winning department participate in a drawing to determine the recipient.

A representative of top management, the divisional superintendent, and the general foreman always participate in the ceremony at which the awards are made. (A photograph of this group with the personnel of the award-winning department is given to each member of the department as a souvenir.

As a token of recognition for top performance, the "Allison Trophy" is placed in the department for the ensuing month. In the event a department becomes a second time winner, a special "All-Allison Trophy" is placed in the department and remains there until such time as another department repeats as a winner.

A follow-up program on such items as scrap losses, leaking machines, efficiency standings, janitor service, safety hazards, and absenteeism has been of tremendous assistance to the management. The quality competition has also had the effect of making all employees cost-conscious and has increased their interest in cleanliness, orderliness. and safety.



1 JOB ORDER MASTER COPY

DATE 10/12/48

ORDER NUMBER 244914

35,000 quad spec. ready rite 5½x8½ 5½x10

Snap-A-Part invoices 25 quads to bk.

1 each of 4 31x43 4 each Rubber Jordan

Set head for punching

White 16 #1 black ¾ at foot
¾ at head Office

Yellow 14 book black ¾ at foot
¾ at head Shipping Dept.

Pink 14 book black ¾ at foot
¾ at head Pickup copy

Blue 16 #1 black ¾ at foot
¾ at head Audit copy

1 Comp. Oct. 12, 48	2 Stereo. Dec. 15, 48	3 Carbon
Oct. 28, 48	Dec. 27, 48	
4 Press Dec. 27, 48	5 Bind Dec. 27, 48	6 Ship
Jan. 6, 49	Jan. 13, 48	
Sched. Hours	Date Released 12/27/48	Sched. to Start
Run No.	Sched. to Finish 1/5/49	Date Finished 1/13/49

JOB ORDER SCHEDULE

PERIOD: From

HOURS AVAILABLE FORMULA 14.0

	Schedule Number	SCHEDULED HOURS Order Number	Scheduled Hours
		Brought forward	
	80	R-2307	21.4
	1	R-2338	20.0
	2	244914	10.7
	3	242077	42.5

DATE 12-6-48

JOB NO. 244914

NO. OF IMP. 8800

Pressman's Name	Makeready Start	Makeready Stop	Run Start	Run Stop

Flexible Production Control for Job Shop Operation

W. A. DAKAN • ASSISTANT FACTORY MANAGER
NEBRASKA SALESBOOK CO., LINCOLN, NEBR.

WHEN WE WERE considering an efficient production control system to fit our own particular needs at Nebraska Salesbook Company, we wanted something as simplified as possible to cover a multitude of orders. Already in effect at the plant was a substantial standard cost system. Therefore, a good foundation was already in existence upon which to start building a production control system.

Press equipment directly controls the volume of production. We can produce no more than the presses produce. Other departments, however, were flexible enough to be changed to meet production fluctuations in the pressroom. That made press units the key to the situation. Therefore, our production control system was developed around the press department. Results have been satisfying.

Within a few months after inaugurating the plan, the backlog of orders was reduced by 300 per cent. Raw materials were brought under better control. Book work for supervisors was greatly reduced. Control of individual orders became a reality. Now one can rapidly locate any job in any stage of production. Use of duplicating methods reduced typing requirements. Other advantages have accrued.

When a production order first enters the production department, manufacturing specifications and instructions are typed on a job ticket envelope. Instructions include routing information to specify the type press on which the job will run.

At the same time job instructions are typed, a job order master copy is made by placing it behind the job ticket envelope. The envelope and the master copy are sent to production control, where additional copies are made for each department through which the job will pass (Form 1). In describing the operation of the system, duplicate copies will be identified as 1A, 1B, 1C, and 1D, to correspond with the composing, stereotype, press, and binding departments, respectively.

AND LOADING RECORD

To _____ PRODUCTION CENTER Jordan DEPARTMENT Press room

per day FOREMAN G. Horst

AND DATES					HOURS AVAILABLE							ADDITIONAL HOURS REQUIRED					
Cumulative Total		Scheduled Dates From	To	Changes	Period From	To	Work Days	Emp. Req.	Total Hours Avail.	Cumulative Total	Changes	Add'l Hours Req.	Cumulative Total	Add'l Emp. Req.	Date Needed	Changes
177	6		3/26			3/26			105 0	141 3						
219	0		1/3			1/3	6		84 0	225 3						
229	7		1/4			1/4	1		14 0	239 3						

SCHEDULE AND LOADING RECORD 2

QUANTITY 35 M PRODUCT Quad. R.R.

STD. M. R. 6.0 STD. RUN 4.7

Number of Impressions	Numbers From	To	Remarks

MATERIALS

DATE 12-6-48

JOB NO. 244914 QUANTITY 35 M PRODUCT Quad R.R.

MATERIALS AND LABOR RECORD 3

Description	Std. Size	No. of Sheets	Basic Wt.	No. of Lbs.	Unit Cost	Total Std. Cost	Mat'l on Hand	Mat'l on Order	Delivery Expected
W. Bond	17½×25	8800	27.2	238	.135	32.13	✓		
Y. Book	"	"	23.4	206	.0775	15.95	✓		
P. Book	"	"	23.4	206	.0775	15.95	✓		
Blue Bond	"	"	27.2	238		34.87	✓		
O.T.C.						71.80		✓	6/1
Tag	25/40					6.50	✓		
Chip	11					2.84	✓		
Ink						2.50	✓		
Cartons						3.80	✓		
						186.34			
5% Freight						9.32			
Total Cost of Material						195.66			

LABOR

Description	Std. Hours	Std. Labor Cost	Std. Burden	
Comp. and Stereo.	7.0	11.97	6.23	
Makeready	13.8	19.87	9.66	
Total Set Up Cost		31.84	15.89	47.73
Press Run	11.0	15.84	7.70	
Carbon				
Bindery	24.2	25.65	16.21	
Total Running Cost		41.49	23.91	65.40
TOTAL STANDARD COST		73.33	39.80	308.79

As soon as duplicate copies are made, one of them (1A) is checked and sent with the job ticket to the composing room.

Each job, upon entering the production department, is assigned a number which is entered on duplicate copies. When the job is sent to the composing room, the master copy is filed numerically in the production control department and stamped (in the composing room section) with the date it was sent to composing. When the job clears the composing room, duplicate 1A is sent back to production control with the finished date stamped on it. This information is recorded on the master copy. The same process is followed in the other departments through which the job passes. This furnishes production control with a progress record. Any job can be located at any time by checking the file.

Job Loading and Scheduling

Before the job is sent to the composing department, it is loaded on a job order schedule and loading record (Form 2). The date the job should be finished in this de-

partment, according to the loading record, is stamped on duplicate 1A. The scheduled standard hours necessary to finish the job are also posted to this copy. When 1A is returned to production control the scheduled time-to-finish is compared with actual elapsed time to see if the department is on schedule. The standard hours on these forms are totaled periodically and used to unload the job schedule and loading record.

Duplicate copies, 1B, 1C, and 1D, for the press, stereotype, and binding departments, are stapled together and filed in a "to be released" file when the job ticket is sent to the composing department.

When the job ticket is finished in the composing room it is released to production control. It is then sent to the cost department (within the production control section) where the materials and labor record (Form 3) is filled in. Form 3 is a result of efforts to combine both cost and control information on one simplified form.

The part to the right of the perforation furnishes cost information. At the same time, it provides a statement of material specifications. This information is determined on the basis of standard costs. The form is made up in duplicate. A yellow copy then goes to the stores clerk, who checks the items to see if they are available, or on order. He also makes the necessary allocations on the stock record. The white copy is sent to production control and filed according to job number. The yellow sheet, or duplicate, is returned to production control after the materials are checked. If non-availability interferes with the scheduled production of the order, it is, of course, noted in production control, and the necessary steps are taken. The white copy is filed in production control until the job is shipped. It is then turned over to the accounting department, where the cost information is posted to a daily cost control sheet. It is then filed in the job ticket envelope to be used for future reference in case the job is printed again, which is often the case.

It will be noted that Form 3 carries a record (lower right) of the hours in each department necessary to complete the job. These hours are predetermined according to standard and form a basis for machine loading as well as costs. The information on labor hours is supplied by the cost department by the same person who supplies the information concerning costs on the upper right-hand side of the form. It is used by the accounting department as indicated above.

The yellow duplicate of the portion of Form 3 to the left of the perforation becomes the "standard" sheet, which is sent to the pressroom with a job.

The press operator records on the yellow copy the actual time required on the job. It is returned to production control, where actual against standard time is calculated. The sheet also forms a basis for a wage incentive payment.

Provides Incentive Record

The white copy, to the left of the perforation, is retained in production control until the yellow copy is returned from the pressroom. It is then filed away numerically with the yellow duplicate. This is done so that we have duplicate records of our standards used for incentive purposes. The yellow copy, on the left side, is used for standards for the press operators, and also for unloading purposes when returned from the pressroom. The white copy is not filled in below the heading, but serves merely as a copy of our original standard in case any questions should ever come up when figuring bonus earnings.

At the same time the duplicate is sent to the pressroom, the hours required are loaded to Form 2. One of these forms is prepared for each production center. As indicated, the form records the number of hours available, the number of hours scheduled, and the date to which the production center is scheduled. This information is necessary before intelligent scheduling can be effective. This form is used for loading in the composing department and all other production centers. The duplicate of Form 3 is used for unloading when returned from the press room.

When the job ticket is ready to be released to the press department, duplicates 1B, 1C, and 1D are taken from the "to be released" file. The dates "released" and "scheduled to finish" are stamped on them when they are sent to the proper departments.

The stereotype copy includes the necessary production specification and serves as a production order. The "scheduled to finish" date corresponds to the date the job should be ready for the press.

When the job is finished in each department, the date finished is stamped on the duplicate sheet. It is then sent to production control, where this information is posted to the master copy to show progress.

As in the composing room, scheduled hours required for the job in the stereotype room are recorded on the duplicate copy. This information is used in the same manner for the loading record for this department.

Information from Form 3 is used to load and unload Form 2 for the bindery, because the job is shipped when it leaves this department and is ready for costing.

We found it beneficial for the binding department to know in advance about specific jobs coming off certain presses. A "report of jobs to be run" form was therefore developed. This form is filled in 24 hours in advance by the press foreman and sent to the bindery. The form tells the bindery the type of product and the number of press impressions for which to prepare. It also tells the size of stock on which job are to be run. By using manufacturing specifications on duplicate 1D, which has already been released to the bindery, binding materials are prepared in advance. This is an important part of our system, and we have found that the 24-hour advance notice is enough.

We found that because of the large number of jobs in process and the quick turnover in some departments it was impractical to use visual controls on all of them. The duplicate copies of jobs are filed numerically in binders in each department and a glance at the bottom one tells the supervisor whether his jobs are moving on schedule. Of course, the copies returned to production control keep this department informed as to movement of the jobs.

Use of the duplicate copy binders in each department freed supervisors from book work for more important supervisory duties. This binder also brought these orders under close control, as a quick glance told him the story. An accurate report of work ahead of each press can now be furnished management from the load records. It is now possible, by referring to load records in the various production centers, to determine an accurate shipping date on a job entering production. For us, this system is furnishing low-cost efficient control.

IN NEW STOCKROOM LARGE ITEMS ARE STORED IN CONVENTIONAL STEEL SHELVING, SMALL PARTS IN ROTARY BINS

Special Shelving Halves Space for Storing Assembly Parts

EARL B. HAMILTON • PLANT ENGINEER, BUCKEYE TOOLS CORPORATION, DAYTON

SPACE REQUIRED for stocking of assembly and service parts at the Dayton plant of the Buckeye Tools Corporation has been reduced 50 per cent by the installation of special-purpose stock cribs. Likewise, manpower required to handle stock has been halved.

The old stockroom, utilizing a total of 1,760 square feet, consisted of a series of wooden shelves with metal dividers. Each shelf unit was 14 feet in length, 2 feet in width at the bottom, and extended to the 12-ft. ceiling. These shelves were made-up in double units with parts storage in both front and back. Narrow, 18-inch aisles between units made it difficult to get stock from the lower sections. Solid sections of this type permitted little light or ventilation, so that reel-type lights were required for use in the aisles.

Although these sections were originally well constructed, cracks eventually appeared in them which allowed the smaller parts to fall through into the lower bins. This caused no end of trouble, especially when inventory was being taken by men who were not familiar with part numbers. Because the shelving was not readily adjustable for various smaller parts, much excessive space was required. In addition, because of the height, the old bins required much climbing.

The new stockroom, the storage capacity of which is somewhat greater than the old, uses only 900 square feet of space. Specially constructed steel bins, 7 feet high, with steel spacers, are used for the storage of large items. Small items are stored in rotary bins in which the spoke-type spacers can be moved to any angle to accommodate any required number of parts. Large aisles now provide good ventilation and light in all sections. In addition, where two men were formerly required to handle the stock in the stockroom, one man is now able to do the job. Furthermore, the production department has put to good use the space gained by this change-over.

PLANT ENGINEERING DEPARTMENT

SHEET NO. _____ S.E.R. NO. _____

ESTIMATE OF: Oil Cleaning Set-up - Switchgear Dept. S.O. NO. _____

ARTICLE	MATERIAL	QUANTITY	PRICE	EST. TOTAL	ACTUAL TOTAL
Filter press	12" square filter press, 10 plates, 11 frames 1" thick	1		365.00	
Pump	No. 53 Rotary gear pump	1		90.00	
Motor	Type K - 225-6-2-1200-530-60-3 motor (TL #83944-existing)				
Control	CR 7008-DIF6R Cat. 4481054 GR 105 switch	1		20.00	
Hose	20 ft. length of type 2-2" interlocked galvanized steel hose with male and female couplings	4	50.00	200.00	
Assembly	Misc. material			20.00	
	Mechanics(72 hrs), electricians(18 hrs), steam filters(18 hrs)	108	1.25	134.00	
	SUPERVISION %				
	CONTINGENCY 5 %			41.00	
	TOTAL			870.00	

ESTIMATED BY: C. B. Muir DATE Nov. 20/48

SHOP EQUIPMENT REQUISITION

S.O. NO. 267752 S.E.R. NO. 2528 TITLE Portable Filter Press DEPT. Switchgear

TOTAL EST. COST $870.00 DATE ISSUED Dec. 9/48 DATE REQ. _____ ISSUED BY: C.B.Muir

QUANTITY	DESCRIPTION	T.L. NO. G.F. & S.O.	UNIT PRICE	EST. COST	EST. BY	PROMISE
1	Only 12" square filter press, 10 plates and 11 frames 1" thick, top corner feed, bottom corner closed discharge, center screw closing. Order from regular supplier, as per letter of Nov. 3. Deliver to accumulation stores.	TL #119887 GF-12946-T		365.00		
1	#53 Rotary gear pump mounted on base and complete with flexible coupling ready to receive direct connected electric Motor. Order from regular supplier. Deliver to accumulation stores (Sheet 1 of 2)	TL #11988 GF-12947-T		90.00		

ACCOUNTING X	TOOL DESIGN _____	ENG. IND. CTL. _____	MACHINE REPAIR _____	EQUIP. INST. X
SUPERINTENDENT X	PLANNING _____	ENG. SWGEAR. _____	MAINTENANCE _____	SPECIALS: _____
PLANT ENG. X	ENG. IND. MTR. _____	ENG. WIRE _____	POWER _____	P. Kitchen
ACCUMULATION X	ENG. FRAC. HP. _____	ENG. GENERAL _____	STEAM FITTERS _____	F.C. Williams

How to Plan Plant Engineering Work—and Get It Done

Careful planning of equipment installations and scheduling of work by the plant engineering department gets jobs done best—and at low cost

C. B. MUIR • SUPERVISOR OF PLANT ENGINEERING, CANADIAN GENERAL ELECTRIC COMPANY, LTD., PETERBOROUGH, ONTARIO

This is the second of three articles describing plant engineering techniques at Canadian GE. The third is scheduled for publication in an early issue.

WHAT WILL IT COST? This is the question the plant engineering department at the Peterborough Works knows must be answered before any project work is done by any of its service divisions.

The cost of every project must be known so that properly authorized approvals can be obtained. For example, jobs costing less than $25 may be handled merely by a request from any operating foreman to a divisional foreman, and charged to that operating department's expense account. But this $25 limit is so strictly observed that if the job runs over, the routine for approval of greater expenditures must be followed.

Another reason for the cost of a project being known in advance is so that the prescribed routines for specifying the work, procuring the materials, and issuing instructions for the work can be followed. These and various other related routines are given in detail in the plant engineering department's basic manual of instructions described in a previous article ("An Instruction Manual Improves Plant Engineering Efficiency," Jan., 1949, page 138). As in any worthwhile system, paperwork to control the procedures has been justified by the results in departmental economy and efficiency. Recognizing that this paperwork, therefore, is based on the basic principles of control involved, the major forms will be now exhibited to show how the company knows just what it is spending on every plant engineering project.

Projects costing over $25 for new installations, major repairs, or replacements are all treated alike. Routines for effective preventive maintenance of equipment are not included in this discussion, but will be described in a third article.

A simple outline of procedures and corresponding paperwork for processing every project would read: (1) Estimate of cost, (2) planning of work, and (3) work order. One or more forms are involved in each of these phases of development.

1 **COST ESTIMATE** is required for every job over $25, whether new or repair work. Actual cost deviation over 5 per cent must be explained

2 **JOB REQUISITION** must contain all data needed to procure and install equipment without further engineering specifications

PLANT INSTALLATION ORDER

TO: Mr. J. Carroll DEPT. Equip. Installation	S.E.R. NO. 2528	S.O. NO. 267752	FOR DEPT. Switchgear
ESTIMATED MAN-HOURS ACTUAL MAN-HOURS	ISSUED BY: C. B. Muir 1/10/49	ESTIMATED COST $870.00 ACTUAL COST	
MATERIAL IN STOCK MATERIAL ORDERED		SCHEDULED START Jan 22/49 SCHEDULED FINISH Jan 31/49 UNSCHEDULED	

JOB Assemble press, pump, and motor in portable unit similar to that existing in the Paint Shop. Apply TL #119887 to press and TL #119888 to pump

RETURN THIS CARD TO PLANT ENGINEERING WHEN JOB IS COMPLETED

3 **WORK ORDER** is issued only when enough material is on hand to start the job. On large jobs, a series of work orders is used

Estimating Cost

When a project comes to the plant engineering department, the first step is to prepare an estimate of the required expenditure (see Figure 1). Details of the project's requirements are gathered by telephone, notes, or conference. The plant engineering department obtains unit material and labor costs from its own files, the purchasing department, or, if necessary, directly from vendors.

Projects estimated over $500 must be approved by the works committee, then by the head office. Projects under $500 need be approved only by the mechanical superintendent. Recently a supplementary form has been adopted to simplify the analysis of special expenditures by the committee in

4 FOLLOW-UP OF WORK ORDERS is controlled by a simple pin wheel file. Lower deck holds scheduled orders, upper all others

appraising the value of a project. This form includes the facts on why the expenditure is required, the savings involved, floor space requirements, and even the expected annual maintenance cost.

Requests for equipment needed for production are usually presented for approval by departmental manufacturing committees made up of the product division manager, engineer, general foreman, and production manager. Projects for plant service and miscellaneous equipment are proposed by the plant engineering department.

Preparation of estimates is considered a serious business at Peterborough, and great care is taken to get accurate figures. Costs of completed jobs exceeding their estimates by 5 per cent must be explained to the works committee.

Planning Work

After approval of a project, the plant engineering division is charged with institution of all plans, forms, and records until the job's completion. These responsibilities are begun with the issue of a Peterborough shop equipment (S.E.R.) requisition (see Figure 2).

This requisition is felt to be the heart of the program. When properly compiled it contains all information required to purchase and install equipment for the project without need of further amendment or individual attention. It should show all material required other than general supplies carried in the stockroom. It should refer to all drawings, layouts, or instructions necessary to the installation. It should include estimated cost of each item as set up on the estimate sheet.

Numbers of shop equipment requisitions are allotted from "blocks" according to whether the cost is under or over $500. Other blocks of code numbers are assigned (for accounting purposes) to show when transfer or removal of equipment is involved.

On large projects a series of requisitions, instead of one single requisition, is issued to cover subdivisions of work or different types of equipment. In this event, one project number with consecutive sub-numbers for each requisition of the series is applied. This makes it possible to start a large project without waiting to engineer the entire project at once.

The shop order ("S.O.") number in the upper left corner of the requisition is needed for the accumulation of all costs in connection with the project. It is derived similarly to the requisition number from predetermined blocks of numbers used for an installation, repair, or replacement of a durable or non-durable nature. Cost breakdowns to any desired degree can be obtained. Numbers are actually assigned in the course of a formal written request (not shown) to the accounting department which clears through the mechanical superintendent and works manager. In this way no job that will cost over $25 can be started without management control.

From the shop equipment requisition, the plant engineering division can easily make up the purchase requisition, which is sent to the mechanical superintendent and then to the purchasing department. At Peterborough, all specifications for production machines, plant equipment, and engineering supplies must be approved by the mechanical superintendent. His approval has the effect of an order to the purchasing department, which is responsible for issuing the order and expediting it.

But the shop equipment requisition is much more than just a material specification sheet. It is used by the plant engineering division to record all data and progress of the procurement of materials. It is really a planning sheet for each project where material procurement is involved.

Referring to Figure 2, the third column of the requisition is for entry of (1) all machine tool numbers ("T.L."), (2) purchase order numbers ("G.F." or General Factory), and (3) shop orders ("S.O.") on materials it might itself manufacture. The system of tool numbers is not unique, but in this plant it is operated with considerable care because it is the basis for an equipment asset inventory of all capitalized machine tools. Every production machine, motor, and service unit (such as pump or fan) bears an identifying metal numberplate throughout its useful life. Tool numbers are pre-assigned on the requisition so that no confusion can result from the moment the

tool is delivered by the vendor. No job is considered complete until attachment of all specified number-plates has been checked.

In the extreme right column of every requisition, a record is kept of the progress of accumulation of material ordered for the job. Material originally known to be in the stockroom is marked "stores" when drawing up the form. Spaces in this column opposite the material to be purchased are left blank for later use.

This is the way the form looks when it is issued to all interested parties, shown by "X" at the bottom of the form. A copy is kept in an individual job folder in the plant engineering division where it is filed numerically in a steel drawer file. Another small card file is kept which contains a departmental cross-index of all active projects. In this file each card shows merely the shop equipment requisition number, the title of the project (as shown on the requisition), and the department. Its purpose is the quick location of requisitions when only the department and nature of the work are known.

Progress of material procurement is reported continuously to the plant engineering department by the stockroom. Promises of delivery are transmitted on a simple paper form and entered in pencil in the "Promise" column of the shop equipment requisition. Copies of receiving slips ("R.S.") are sent in for similar notation.

Ordering Work

Not until all materials have been delivered, or sufficient items are on hand to warrant starting the job, is the actual work order issued. This is done by typing the necessary details on a "Plant Installation Order" (see Figure 6), which is a 4x6-in. index card. Copies go to the plant engineering division doing the work, and to other interested parties, such as the manufacturing department affected. The stockroom gets a copy to tell it when the accumulated materials should be ready at the "scheduled start" date.

The plant engineering division's file copy is placed in one of two levels of a circular pin wheel rack file (see Figure 4). The upper level has slots around the periphery marked with manufacturing department account numbers. The lower level has 52 weekly slots marked by monthly and weekly divisions. Unscheduled jobs, i.e., work that can be done at any convenient time, and therefore used as fill-in, are put in the upper level of this file according to the department involved. Scheduled jobs, i.e., those showing a "finish" date, are placed according to this date in the lower level.

Foremen of the engineering divisions make every effort to meet the scheduled finish date. Each Friday morning all four foremen meet with the plant engineer to review all current jobs, discuss problems, and expedite jobs where possible. Sometimes readjustments are necessary, and the manufacturing foreman is advised accordingly. These meetings are resulting in better cooperation of all divisions because of the clearer understanding gained of the other fellow's problems.

Projects that require labor with or without materials wholly obtainable from the stockroom are handled by a work order, without a preliminary shop equipment requisition. In this case the estimate of cost appears on the formal request for a shop order number, which, as previously stated, must always clear through management channels for approval.

Where a large project is involved, such as rearrangement of an entire department, separate work orders are issued for divisible sections of the shop equipment requisition. This in turn might even be a subdivision of a larger project. In such event, work orders are issued as the work progresses, and orders are numbered consecutively in the lower right corner in the order in which the work is to be done. In this way, work orders do not drag along because of complex requirements, and are turned in more quickly. Progress is more easily watched and checked, and breakdowns by trades are possible.

Nothing has been said regarding "quality control" of engineering workmanship. This, of course, is a responsibility of the division foremen and assistants. Key contribution to this objective, it is felt, is the gradual building up of installation instructions in the plant engineering manual described in the first article of this series. Wherever possible, work orders will increasingly refer to these instructions as work standards.

When a work order has been completed, it is signed by the division foreman and returned to the plant engineering division office. The copy in the pin wheel file is removed and sent to the accounting department to show the job is finished. The active requisition file is cleared and closed when the last order comes in. Under the shop order regulations, no item of cost can escape this final reckoning. Periodic cost reports go to management and plant engineering.

The same procedure of work orders applies to projects for transfer of all equipment between departments and whenever equipment and the plant engineering division.

Closing Steps

Mention has already been made of the attachment of tool number plates to all new equipment. Of equal importance and as a final step in the completion of a job, the foreman must report the machine data on the reverse side of the completed work order. These consist of the description and manufacturer's nameplate data concerning the machine, motor, controllers, and all accessories. This information goes to make up an equipment record which is being used in the preventive maintenance routine to be described in the next article.

All these procedures for controlling the flow of plant engineering work and getting it done as wanted are a part of the plant engineering basic instruction manual. Because these paperwork routines have been established so that all supervisors know what is expected of them, guesswork is outlawed right from the start. If in doubt, one can always consult the manual. And when each job is finished, the careful correlation of routines can be depended upon for recording essential facts of what was done and how much it actually cost.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 134) . . . a summary of **LABOR DEVELOPMENTS** (page 212) . . . things **YOU WANT TO KNOW** more about (page 204)

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

A LARGE 8-BALL PICTURE is awarded to the worst department in the weekly competition for clean and safe housekeeping at Clark Equipment Company, Battle Creek, Mich. The foreman of the "winning" department is given a small 8-ball pin to wear, too. Originally intended only for supervisors, the program picked up momentum when plant workers got whole-heartedly behind their supervisors to keep the telltale award out of their departments

Drill Press Mounted Overhead Saves Time

A substantial amount of handling time has been saved in the power-belt-conveyor channel production division by mounting drill presses on trolley-equipped I-beams at Rapids-Standard Company, Inc., Grand Rapids, Mich. This makes it possible for employees to move the drill press to the channel frames rather than move the heavy frames to the drill press, as was done formerly.

Drill presses can be quickly and easily moved from one drill location to the other, with a minimum of effort on the part of the operator. Production has been substantially increased. The old method of moving the cumbersome section of channel frame to the drill press was fatiguing and required an abnormal amount of handling time.

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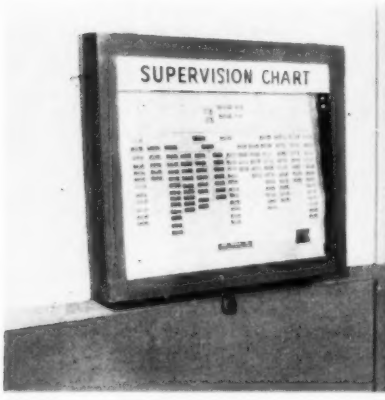
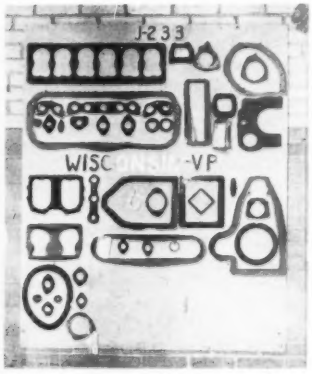


Organization Charts Identify Supervisors

Line organization charts are located in every department at Oldsmobile Division, GMC, Lansing, Mich. It is easy for any worker, or visitor, to check these conveniently located charts and determine who is the supervisor of any particular function.

These charts are located in glass enclosed, locked cabinets. Each cabinet has a 25-watt fluorescent tube for lighting. The display cabinets are always placed in a permanent position. The charts have really paid off, because confusion has been eliminated.

Above, an employee looks over the general supervision chart which outlines the divisional heads and other key supervisors. Charts are prepared by the company's standards department and are replaced as changes in the organization occur.



Gasket Silhouettes Warn of Low Supply

The practice of stenciling tool silhouettes on storage boards has proved invaluable to many plants (see FACTORY, June, 1948, page 133).

Here is another adaptation of the same idea. Gasoline engine gaskets are stored on a wall rack in the ground equipment maintenance shop of Pan American World Airways, Atlantic Division, La Guardia Airport, New York. The board carries engine designations and provides space for each gasket required.

When a black silhouette shows up on the white board it's time to re-

order a new supply of gaskets. With this method, gasket supplies are always visible and properly protected in a safe place.

Gaskets were formerly stored in their wrappers on shelves in the storeroom. It took time to find them, and they were frequently damaged. No time is lost now in selecting the proper gasket for the job.

•

HOUSEKEEPING IS IMPROVED at Stewart-Warner Corporation, Chicago, by placing a shelf on the lower part of each shop chair for the employee's personal belongings. The shelf is installed with a slight pitch toward the rear of the chair to keep items from falling out. One-half inch mesh wire screening is used on three side of the shelf to form a basket. Result—plant housekeeping is improved and employees' personal belongings are protected

•

Numbering Plan for Building Columns

DANIEL V. McPARLIN, Plant Engineer,
The Okonite Company, Passaic, N. J.

The practice of numbering alike all superimposed building columns in its multi-story plants has benefited plant engineering in The Okonite Company several ways. By this method, for example, columns "11" on all upper floors would be located immediately above column "11" on the first floor.

Here are some of the advantages of this system of identification. When a craftsman gets an order to work in areas adjacent to specified columns, he loses no time hunting around for the locations on different floors, because geographically they are always alike. This system also facilitates spotting leaks or other troubles originating on floors overhead. It makes easier, too, the job of tracing pipelines going from one floor to another.

Often it is necessary to check structural load requirements on upper floors when setting new machinery. This check is simplified by the numbering system, which makes it possible to know quickly what is underneath, either when reviewing blueprint plans or by actual plant inspection.

BAR STOCK for automatic screw machines is stored in bays at the Burroughs Adding Machine Company, Detroit. Brass, bronze, and several types of steel, in varying lengths and diameters, are stored vertically in racks with tags attached indicating specifications. Aisles are sufficiently wide to accommodate trucks and skids for the handling of all stock

BAGGED MATERIALS are handled by a new method at International Graphite & Electrode Corporation, St. Marys, Pa. Bags are stacked in pairs on wooden pallets, each perpendicular to the adjacent pair. An adhesive between them helps prevent slipping. The top layer of bags is steel-strapped and serves to hold the entire load firm. The palletized bags are then removed quickly and safely by fork lift truck

•

Overhead Conveyor Reduces Handling

The new overhead conveyor is 100 To cut handling costs and increase output in a limited space, the

France Manufacturing Company, Cleveland, installed an overhead power conveyor for carrying cold rolled and formed transformer boxes through degreasing, painting, and drying operations.

These three operations were confined to an area measuring 10x40 feet. Prior to the installation, the 6x6x12-in. transformer boxes were brought to the hand spray booth in tote pans. Then they were sprayed by the operator, loaded on oven trays, and automatically transported through an oven drying unit. Considerable hand handling was required in all these operations.

The new overhead conveyor is 100 feet long with S-hook type carriers on 6-in. centers. It is loaded by an operator just prior to the degreasing operation. Boxes are then transported through a degreasing tank, next to a paint dip tank, and then to an overhead infra-red drying oven where the plain finish is dried. After drying, the parts return to the original loading point where the same operator unloads them. This is also the beginning of the assembly point.

Besides increasing production in the same floor area, the installation has reduced handling costs 50 per cent. And 50 per cent less paint is required for dipping the boxes than for spraying them.

•

Squeeze-Type Truck Stores Paper Rolls

A power truck, equipped with a specially designed squeeze-type roll upender, is making quick work of storing different sizes and types of paper at the Hankins Container Company, Cleveland.

The paper rolls weigh from 100 to 500 pounds, measure about 3 feet in diameter, and vary in width from about 6 inches to 2 feet. Consequently, storage space is a serious consideration. Careful handling is also important, since damage to the paper can seriously reduce the yield per roll.

Formerly rolls were stored with the round surface resting on the floor, and the pile was built up in much the same way the Army stores shells. Handling the rolls by hand was difficult and dangerous.

The company first experimented with storing the rolls on the flat surface, and a truck with a tongue-type upender was bought for the purpose.

Although a considerable improvement over the hand method, this trial produced some unexpected results. It was found that the paper rolls were so heavy that it was difficult to insert the tongue between rolls for removing them to the production floor without damaging the rolls considerably. Since rolls are stacked to a height of 13 feet, the truck operator had to climb a ladder to insert the blocks before he could place the rolls on the stack. In addition, the blocks themselves took up considerable storage space.

The new power truck grasps the rolls firmly on their circumference and stacks them flat to flat. Considerable time is saved in handling. For example, with the old type upender, eight minutes were required for removing twelve 2-foot-thick rolls from the trucks and stacking them in the warehouse. The same rolls can now be stacked in five minutes.

Damage to the rolls has also been all but eliminated.

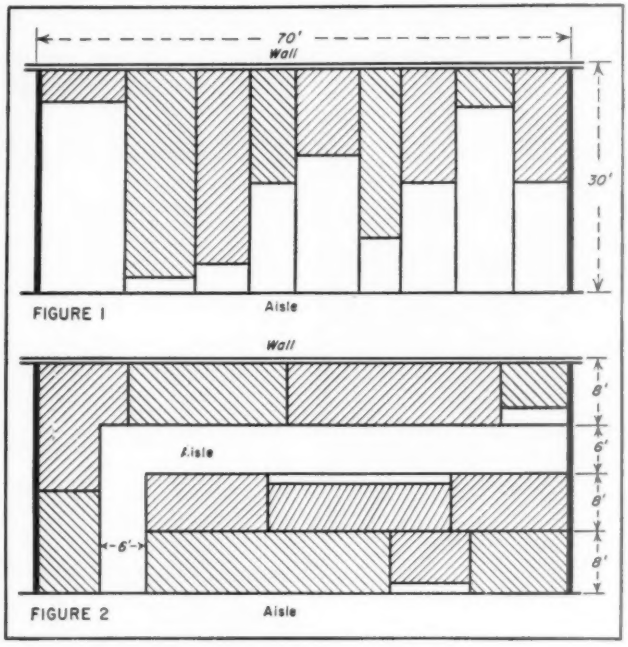


FIGURE 1

FIGURE 2

Relocation of Aisles Frees Storage Space

By redesigning and relocating a few stockroom aisles, the Electro Manufacturing Corporation, Chicago, freed approximately 2320 square feet for storage. This change-over will result in an annual saving of $1900, computed on the basis of an average occupancy cost of 80 cents per square foot.

Handling and storing materials have always been important problems at the plant because of the bulky nature of the parts that go into the manufacture of fluorescent lighting fixtures. The difficulty was accentuated by rising costs and shortage of space. Yet the stockroom problem and its solution proved so simple that the company believes this very simplicity is the reason they were overlooked.

Because of the layout of the building, much of the stockroom is divided by walls and main aisles, resulting in four distinct areas, each with a floor space of approximately 2100 square feet. The original method was to store stock in rows perpendicular to the walls (as shown in Fig. 1). When the inventory of any particular material was at a maximum it would extend into the aisle. When it was at a minimum it would be backed up to the wall. On the average the stocks occupied only about one-half of the allotted space, so that in each of the areas there was a loss of about 1050 square feet.

The situation was improved by placing L-shaped aisles (Fig. 2) in the center of each of the areas so that every point in the area would be within eight feet of an aisle. Each of the aisles required only 468 square feet, and they were made just wide enough to allow passage of trucks. The latter arrangement has the double advantage of conserving floor space and the employees from leaving stocks in the aisles.

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MAR.-49

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MAR.-49

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likely, doesn't have much chance. Look for 60 or 65 cents.

There will be some liberalization of social security, but no compulsory health insurance. Even so, payroll taxes may go up $2,882,000,000.

Atomic strikes won't be banned in the atom labor code the Davis Commission will hand to Truman. Instead, it will call for voluntary no-strike, no-lockout pledges with an impartial board to settle disputes.

The code will be ready in time for CIO and AFL June deadlines at Oak Ridge. AFL could, and almost did, strike the national laboratory there last summer despite a national emergency injunction.

At the Hanford plutonium plant out in Washington AFL has just won bargaining rights for 3200 craft employees. First contract negotiations are under way with General Electric Company.

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Communists are agitating for trouble in fourth-round wage negotiations. ***UAW's Walter P. Reuther is under heavy attack for the General Motors cost-of-living escalator clause and for putting security benefits ahead of higher wages this year.***

A new element in major wage talks will be supplied by BLS. It's a series of 25 wage chronology studies showing what's happened to wages and fringe benefits in particular plants, industries, or areas during the history of union bargaining.

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FIGURE 2 Aisle

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LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Don't be surprised if Truman's strategy on labor legislation boomerangs.

Congress wants to play ball with him on labor law revision, higher minimum wage, improved social benefits. But it feels he went too far in labor's favor.

So Congress will make up its own mind. Result: Truman will get more of the Taft-Hartley law than he expected. On wage-hour revision, he'll get less. And it's a pretty good bet he won't get national health insurance at all.

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On Taft-Hartley, there's talk that Congress will keep so much of it that Truman may consider a veto. We don't think Congress will go that far. But the new bill will have plenty of T-H in it.

We mean things like these: Injunctions in national emergencies, Communist affidavits for bosses and union leaders alike, a club over jurisdictional disputes and some secondary boycotts, "free speech" for employers, financial reports by unions.

On wage-hour, administration backers in Congress have given up hope of bringing more workers under the law. Even the 75-cent minimum, once considered likely, doesn't have much chance. Look for 60 or 65 cents.

There will be some liberalization of social security, but no compulsory health insurance. Even so, payroll taxes may go up $2,882,000,000.

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Every day the columns of the Communist *Daily Worker* plug for greater militancy on the wage front. Responsible right-wing leaders are criticized for accepting arbitration awards that deny wage increases. A left-wing UAW local at Fisher Body wants to repudiate the GM contract because of the wage cut coming.

Arbitration is under union attack because of recent denials of wage increases. CIO's Emil Rieve is "disturbed" because some arbitrators look at future business prospects in making decisions. His union won't arbitrate any more cases, for the time being.

Other unions will shy away from arbitration while the economic facts weigh heavily against a wage boost. In Philadelphia, CIO struck the transit system rather than accept a 3-cent wage boost or arbitrate. (Strike was settled after 10 days for 8 cents.)

Troubled arbitrators may get some guidance from the new National Academy of Arbitrators. It's making a study of arbitration ethics, will discuss problems with labor and management officials.

It's beginning to look as if we'll have more labor trouble this year than last.

A new element in major wage talks will be supplied by BLS. It's a series of 25 wage chronology studies showing what's happened to wages and fringe benefits in particular plants, industries, or areas during the history of union bargaining.

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LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

What kind of economy should the U.S. have? And who shall shape this economy?

The Truman Administration is currently laying down its economic blueprint—in reports of the Council of Economic Advisers, in bills presented to Congress, and in testimony of administration leaders.

Leon H. Keyserling, vice chairman of the Council of Economic Advisers, did much of the drafting. Many of the basic ideas are his. He has the ear of White House aides. He has led the fight in Congress.

Highlighting the administration's economic goals are these: Continuing increases in consumer incomes to raise living standards, steady expansion of industry, broader social welfare programs, government action to "stabilize" the economy and so iron out the business cycle to ward off "busts."

Steel production would be raised from 88 million tons in 1948 to 119 million in 1958, to insure full employment and full production.

Power output would be raised from 73 million kilowatts to 119 million in 1954. Government would push development of river valleys, other natural resources. The country's roads, schools, housing, agriculture, forests—and other resources—would get increasing federal attention.

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How would all this be done? Administration plans for the short run were summed up in the Spence Bill, introduced in mid-February. It would give the President authority to fix prices and wages, particularly in industry, to put priorities and allocations into effect, and to use government funds to expand production.

All this was in the name of fighting inflation. Declining prices, dropping sharply on a broad front since November, put skids under the crisis. But the administration backed the bill. One item in it—giving the President power to use government funds to expand production in key industries through direct government construction—seems a king-pin of the long-range plan being pushed by the President's advisers.

Two major ideas of the long-run program came from Keyserling and J. D. Clark, also of the Council of Economic Advisers, in testimony before Congress:

1. The President needs far-reaching power to regulate the economy in the interest of "stabilization." Keyserling is reported to have testified: "No one in industry or business can afford to act alone in the interest of stability." In short, the government must be the judge of policy on prices, production, and expansion.

2. To have stabilization, and to meet the evergrowing demands on it, the economy must continue to expand. Few economists would quarrel with that idea. But few would carry it as far as Clark is reported to. The President, he says, must have the powers requested, including "the right of the government itself to become a producer."

What happened in Washington in February shows that the Administration's plan to stabilize the economy by federal regulation embraces government action on many fronts. Included—among other things—are the tax program, rent control, export control, credit controls, development of basic resources, housing, and social welfare. They all fit into the council's basic theme: encourage spending, discourage saving by people and by business, raise the standard of living, and let the government provide security.

•

How to pay for all these things? The money to start this program, says the administration, can come from business profits. By taxing profits, the government might slow down business investment in new plants and equipment. But if that should happen, it would make little difference to the planners. The council feels industrial capital expenditures have been too high.

The council hasn't considered one other point, apparently. *The McGraw-Hill survey of Business' Needs for New Plants and Equipment, reported in FACTORY last month, showed that business plans to continue to invest in new plants and equipment at a high level, that its needs for new facilities are huge, and that profits are paying for a substantial part of those facilities.*

Taxing profits drastically seems sure to cut down industrial expansion. And that would check ideas of paying for expanding social welfare programs from increased production of private industry. The government then, of course, would have to undertake to expand industry itself.

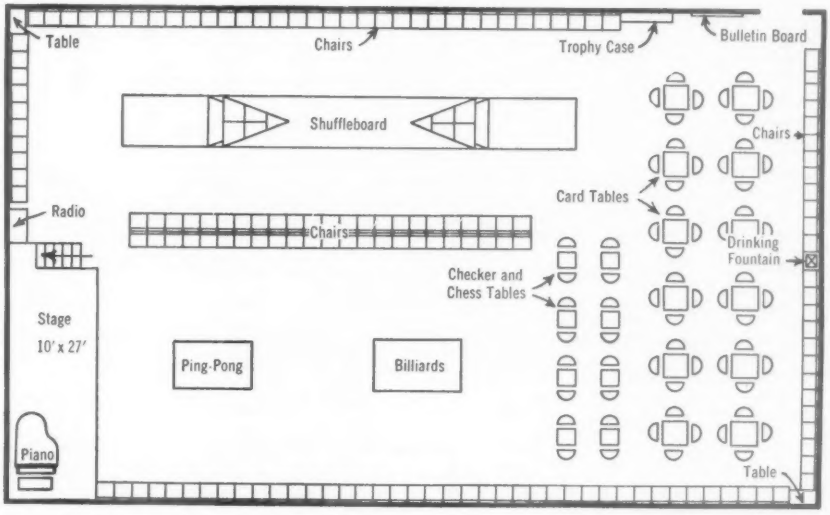
•

The danger in all this: In the name of saving capitalism and free enterprise, the Administration is advocating something very close to *state socialism.* Anything that upsets the plan to make over the economy would throw the country into *full-fledged socialism.*

management data sheet 40

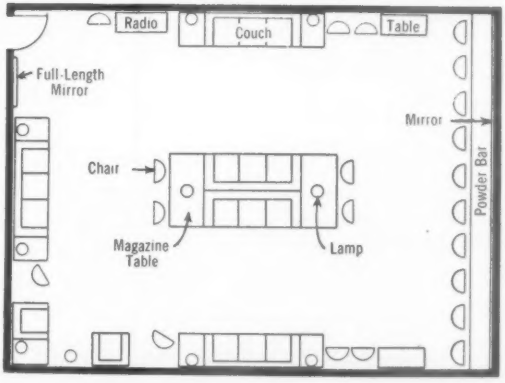
Plant Recreation Room, Lounge and Smoking Rooms

CONCLUDED in this issue is a series of floor plans for employee facilities. See February issue for diagrams of wash, shower, and locker rooms. Properly planned recreational facilities for employees are conducive to high morale. The following plans have been developed to yield a high degree of employee satisfaction.



RECREATION ROOM (113x57 feet) should incorporate facilities to care for recreational needs of a majority of employees. These rooms should be considered an integral part of an industrial relations program. Non-skid flooring is important, particularly in the area where ping-pong is played. Inlaid shuffleboard design flooring may be used. Plan provides adequate floor space around all active sports areas.

LOUNGE (40x30 feet), while designed for women, is adaptable for men. Illumination should be ample for reading, but not too glaring for those who desire to rest. Adequate ventilating facilities should always be provided. Long powder bar accommodates 10 women.



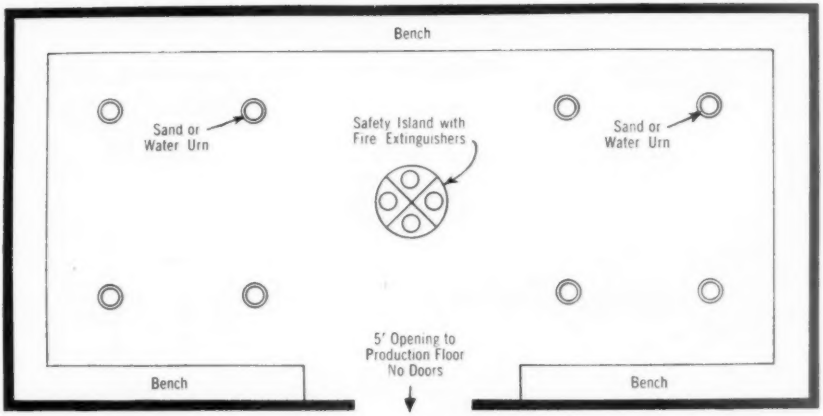
Source: Washroom Advisory Service, Scott Paper Co., Chester, Pa.

CONTINUED ON PAGE 132

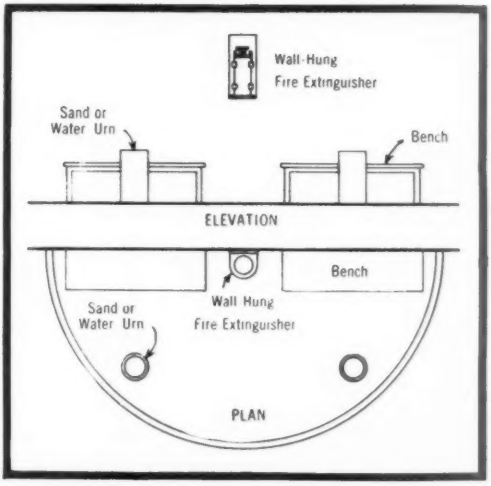
management data sheet 41

Plant Recreation Room, Lounge and Smoking Rooms

CONTINUED FROM PAGE 131



SMOKING ROOM (35x17 feet). The average washroom was never designed for use as a smoking room. Today, many plants are extending smoking privileges to employees. Special smoking room serves as an additional protection against fire and promotes time-saving for both employer and employee. Adequate ventilating and fire-fighting equipment should be provided. Planning should assure use of completely fireproof construction materials.



SMOKING AREA (7½-ft. radius). Designated smoking areas at strategic locations in production areas are desirable if insurance laws permit. Areas should not be too far from workplaces. The semicircle shown should be painted red to indicate a restricted smoking area.

Source: Washroom Advisory Service, Scott Paper Co., Chester, Pa.

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WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market

Air Circulator

Available in wall, floor, and table-top models, Surf 24-in. air circulator has a 3-speed, ¼-hp. induction motor, with positive internal switch control. Air delivery is 7000, 5400 and 3800 c.f.m. at high, medium, and low speeds. Other features include three air flow adjustments, safety feature that prevents fan from tipping over, removable chrome-plated fan guard. High and low pedestals, for adapting fan to wall, bench, or floor use, are of large diameter so they don't have to be fastened down. The high stand, for floor use, adjusts from 5 to 8 feet high. G-M Laboratories, Inc., 4300 N. Knox Ave., Chicago 41.

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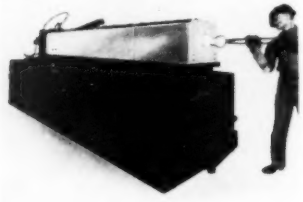
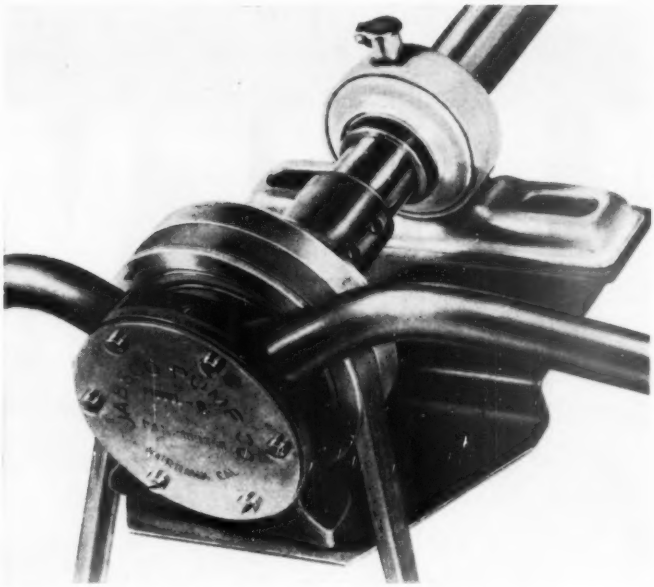


Induction Heater

Capable of delivering a 2½x3x15/16-in. steel blank every 4.8 seconds, with every blank at a closely controlled temperature of 2200 deg. F., according to the manufacturer, the Ajax-Northrup induction heater permits the operator to flip the billets directly into forging. Fast heating allows little time for scale to form, which reduces down time required to clean out dies, and lengthens die life.

Timing is automatic. Blanks put into a chute at the far end are automatically fed into the heating coil by a hydraulic pusher. As each cold billet is fed in, a hot billet is pushed out at the press end. Since the coils are interchangeable, smaller or larger diameter coils may be substituted to produce greater efficiency on long-run small-diameter work, or to accommodate diameters larger than 2½ inches. Power source is a 700-kw., 960-cycle motor generator unit, of which 100 kw. is held in reserve for larger billets or for a shorter timing cycle. Ajax Electrothermic Corp., Trenton 5, N. J.



Evaporative Cooler Pump

Rubber impeller pump, Model 1089, designed for evaporative cooler air conditioning use, is driven by the fan motor, eliminating the need of a separate motor. For coolers of less than 7000 c.f.m. capacity, the pump may be attached directly to the blower shaft by means of an adapter coupling which transmits the rotational power and at the same time supports the pump. A mounting plate of angle iron fastens to the cooler frame to hold the pillow block secure, and also keep the pump from rotating on the shaft. For coolers of more than 7000 c.f.m. capacity, the pump is belt-driven from a sheave installed on the blower shaft. Port size of pump, which weighs 3½ pounds is ⅜ inches, and a capacity up to one hundred times the evaporation rate may be achieved, according to manufacturer. Capacities range from 65 g.p.h., at 500 r.p.m., to 240 g.p.h. at 1750 r.p.m. Other features include self-priming at all speeds; only one moving part, and no metal-to-metal contact with the moving part. The oil resistant impeller may be reversed and is replaceable when worn. Jabsco Pump Co., 2031 N. Lincoln, Burbank, Calif.

Flooring

Described as a durable but resilient heavy-duty resurfacer, manufacturer states that Resn-X Flooring can be brushed or troweled over any type of floor, to a thickness of 1/32 to 1/16 of an inch. It is said to be non-slip and an electrical insulator, to have resistance to solvents and chemical corrosives, alcohols, glycols, oils, waxes, most acids, alkalies, water, salt, and other solutions. It may be used inside or outdoors. Available ready mixed in 6-gal. containers, in tile red, utility green, and medium gray. Coverage per gallon is said to be approximately 60 square feet at 1/32-in., and 30 square feet at 1/16-in. thickness. Manufacturer states that it can be walked on in 6 hours, dries hard in 24. Rock-Tred Corp., 627 W. Washington Blvd., Chicago 6.

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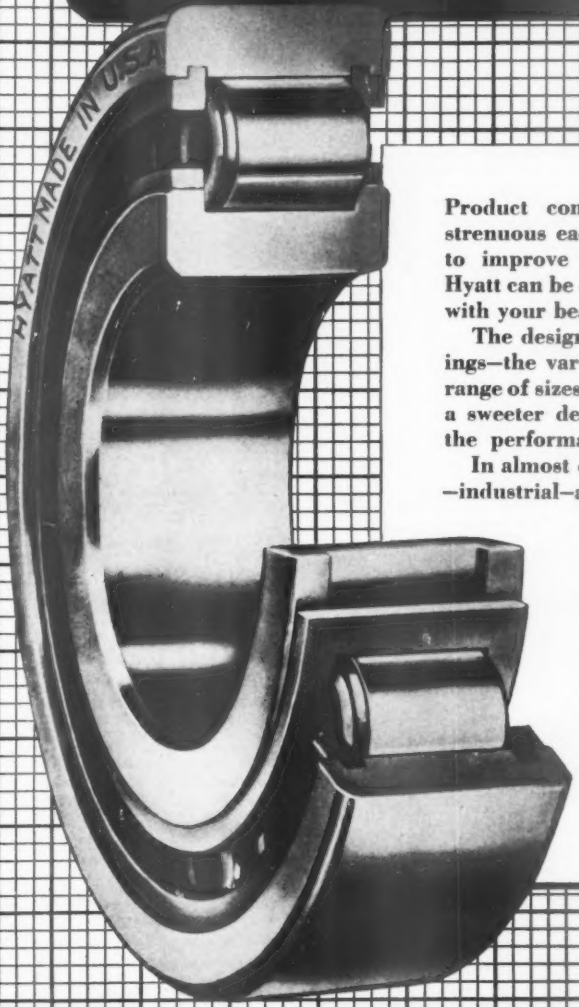
Valve

Manufacturer states that the design of recently developed cast steel valve now makes it possible to install a size smaller valve in pipe

A PRECISION PRODUCT for perfect Design



Product competition grows more strenuous each year. In your effort to improve your product design, Hyatt can be of immense help to you with your bearing applications.

The design of Hyatt Roller Bearings—the variety of types—the wide range of sizes enables you to produce a sweeter design that will improve the performance of your product.

In almost every field—automotive—industrial—agricultural—petroleum—steel—textile—construction—transportation, Hyatts have been preferred because each Hyatt is a precision product backed by more than fifty years of acceptance by quality manufacturers. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS

lines. Stop and non-return valves in either the globe or angle type use this body for all sizes 6 inches and above in 900-, 1500-, and 2500-lb. classes. They are available with pressure-seal or bolted bonnet, and with flanged or welding ends. Pressure loss in the new body design is said to be reduced by streamlined internal contours which eliminate wear producing turbulence by reduction of weight in all floating parts, and by equalization of pressures in all internal areas of the valve. Edward Valves, Inc., Subsidiary of Rockwell Mfg. Co., East Chicago, Ind.

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No-bounce Hammer

Hollow metal head of "no-bounce" hammer, designated the Tahlen hammer, is loaded with steel grit said to absorb rebound off solid surfaces, reducing shock to wrist and arm, and resulting in harder blows. Plastic Tenite tips, $1\frac{3}{8}$ inches in diameter, are force-fitted onto the hammer head, and will withstand heavy impact without cracking or flaking, according to the manufacturer, yet will not mar the surface no matter how hard the blow. The handle is of first-grade hickory, and seamless tubular steel is used for the head and ferrule. H. F. Soderling Co., 1745 Fourth Ave., S. Seattle, Wash.

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Distribution Cutout

Type HC, high-capacity cutout with an interrupting capacity of 8000 amperes at 2500 volts or of 5000 amperes at 5 kv., is rated at 5 kv., 50 amperes, and will take any standard universal type fuse link up to its capacity. It is applicable for use on 2400-volt delta, 4160-volt Y, 4800-volt delta, and 8300-volt grounded Y systems. Cutout consists of the porcelain box used in the current EA standard interrupting capacity design and a high-strength, high-capacity door. The door can also be purchased separately and used as a direct replacement for existing doors of standard EA cutouts. The high interrupting capacity is obtained by removing the old door and installing the new, with no changes in the present cutout box or wiring. Both dropout and non-dropout doors are available. Manufacturer states that cutout can be installed in locations where high capacities are required, or the new type HC door only can be installed on existing EA cutouts where short-circuit currents have grown beyond the rating of the existing cutout. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

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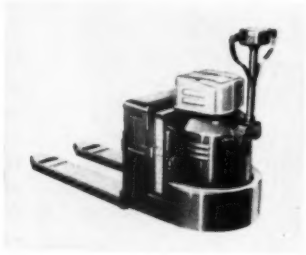

Battery Powered Hand Pallet Truck

Features of Model W battery-powered hand pallet truck are said to include rapid lifting of loads, high traction, safety handle with control buttons for either right- or lefthand operation, 3-point suspension for smooth travel over uneven surfaces, and differential-action trailer wheels that eliminate wheel scuffing and provide easy turning. An automatic cutoff shuts off the power supply to the motor upon release of the control handle, according to the manufacturer, and applies a quick-acting brake to the drive shaft, immediately stopping the truck. Towmotor Corp., 1226 E. 152nd St., Cleveland.

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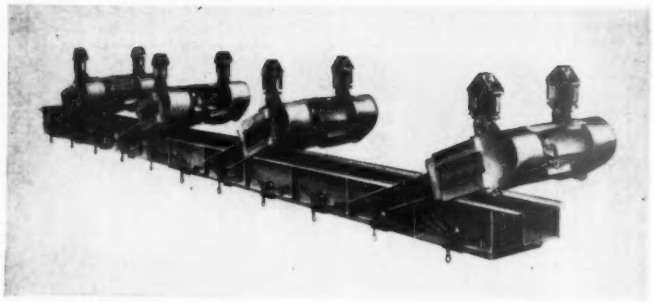
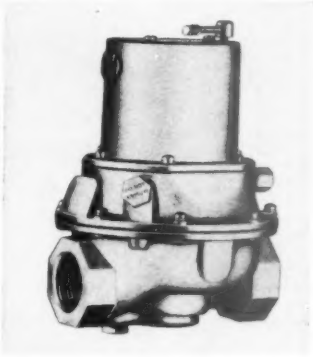


Long Vibratory Conveyors

Available in various lengths and capacities, for suspension or base mounting, vibratory conveyors are powered by one or more motors mounted either above or below the trough, depending upon the available room. They are suitable for handling of hot, abrasive material; or when provided with sealed tubular troughs, for conveying dusty, poisonous materials, or pure foods and pharmaceuticals free from contamination. Movement of the trough is confined entirely to the spring system of the vibratory motor. A dial switch provides variable control of the rate of material flow. The Syntron Co., 480 Lexington, Homer City, Pa.



Electric Diaphragm Gas Valve

Designed for control of natural, manufactured, mixed, and liquefied petroleum gases in unit heaters and furnaces, B-50 electric diaphragm gas valve has no packing glands or bellows. Current consumption is 5 watts. Standard model and manual opening model are available with or without electric trip. Made in two small sizes, $\frac{3}{8}$- and $\frac{1}{2}$-in. i.p.s., diameter $2\frac{3}{4}$ inches; two medium sizes, $\frac{1}{2}$- and $\frac{3}{4}$-in. i.p.s., diameter $3\frac{7}{8}$ inches; and three large sizes, 1-, $1\frac{1}{4}$- and $1\frac{1}{2}$-in. i.p.s. diameter, $5\frac{1}{4}$ inches. General Controls Co., 801 Allen Ave., Glendale 1, Calif.

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Air Conditioner

Designed for use with portable compressors or where air supply is limited, light-duty air conditioner, Black Arrow Model N9500, has a capacity of 14 cfm. at 60 pounds pressure. The cylinder tube is cold-impact extruded aluminum capable of with-

He's a thief of the "sneak" variety—pilfering, robbing, stealing valuable production from machines in thousands of plants. The cost of his thievery is staggering—but he *can* be stopped!

You may not even suspect that he's at work in your plant. You may have to *look* close to find him. But there's a big reward when you do.

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Are you lubricating machines the hand and muscle way? *Watch for losses here!*

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What about "down-time"—production interruptions for lubrication, or for part replacements due to faulty lubrication? *More thievery!*

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Now are you suspicious that a production thief is working in your plant?

His disguise is "old-time, hit-or-miss, costly lubrication methods" that add to the costs of production.

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An Alemite representative can tell you in 10 minutes how Alemite Methods will simplify and better organize your lubrication procedures. He can show you how mechanized lubrication from barrel-to-bearing will increase your production and profits.

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standing 1000 psi. Filtering element is constructed of brass, and the regulator body and cap are of forged brass. Cap contains all-brass parts, plus a cadmium-plated steel spring. Equipped with one light-duty regulator with a 100-lb. gage showing regulated air pressure, one regulated pressure outlet, and a draincock at the bottom of the tube for draining off moisture and oil. Black Mfg. Co., Baltimore 2, Md.

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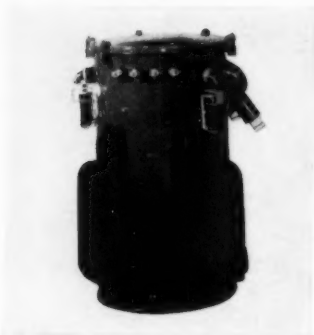

Three-Phase Transformers

Line of CSP three-phase distribution transformers incorporates built-in De-ion lightning arresters, three mechanically interlocked, heavy-duty circuit breakers on the secondary side as safeguards against overloads and short circuits, and primary protective links for system protection. The secondary breaker, Type BR, is said to be capable of interrupting 10,000 amperes at the usual secondary voltages. Transformers are available in sizes of 9, 15, 30, 45, and 75 kva. for primary voltages of 2400 to 14,400 inclusive, and with secondary voltages of 208Y/120, 240 delta, 240 by 480 delta for the primary classification in accordance with present standards. They are equipped for pole mounting or can be mounted on platforms or mats, as required. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

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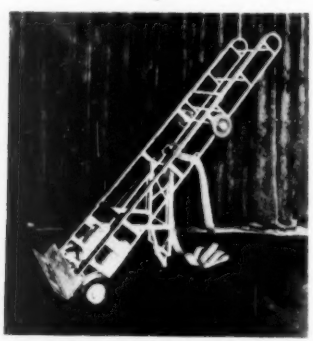

Crawler-Type Hand Truck

Line of hand trucks, called the Stevens Escort trucks, have in addition to their regular wheels a rubber caterpillar tread which rolls over steel bearings set in an aluminum frame on the back of the truck. This permits loaded trucks to be moved up and down stairs, over curbs or other irregular surfaces without slipping or bumping. One model, made of seasoned hardwood, is equipped with two tie straps, or a safety belt fastener and one strap. Two models, A-2-S and S-2-S, one weighing 33 pounds for an 800-lb. load, the other weighing 47 pounds, for a 1200-lb. lad, are made of aluminum tubing. They are 60 inches high, 16 inches wide, have a 24-in.-long footplate with a 4-in. lip. Models A-2-S-M, aluminum tubing frame, and S-2-SM, constructed of steel, are equipped with a retractable swivel wheel which, when dropped, permits unit to be rolled with no weight on operator. Two other models, EAN-1 and EAG-1, 48 inches high, 14½ inches wide, are available in either aluminum or steel, with one or two handles. Associated Services, 224 W. Main St., Carlinville, Ill.

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High-Pressure Valve

Line of diaphragm-actuated 2-pressure valves for high pressure hydraulic service ranges in size from 1 to 4 inches, for operation on systems having 3000-, 5000-, and 10,000-p.s.i. pressures. Manufacturer states that variations of valve assembly provide for diaphragm-controlled high-pressure inlet, slow-travel valve, or stop valve, all handled within one casting and with minimum pipe connections. Seats and disks may be interchanged between main valve and check valve assembly. Use of heat-treated monel seats and disks in a bronze valve body is said to eliminate electrolysis. Seat rings can be reversed, and the need for gaskets as pressure seals on cap ends is avoided, according to the manufacturer. For either oil or water hydraulic service. Emmett Machine & Mfg. Inc., 2249 Fourteetnh St., S.W., Akron 14, Ohio.

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Hardfacing Alloys

Line of 15 hardfacing alloys divided into three primary groups—ferrous, cobalt-base, and tungsten carbide—has been developed to combat abrasion, impact, heat, and corrosion. Alloys are said to increase the work-life of equipment. One substance, called Aircolite, is suitable for oxyacetylene and electric arc applications on equipment subjected to severe abrasion and medium impact, such as pulverizer hammers and core crusher rolls; another, a self-hardening alloy, applied by electric arc, may be used on equipment subjected to severe impact and abrasion, such as bucket teeth and sizing screens. Air Reduction Sales Co., 60 E. 42nd St., New York 17.

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Portable Sander

Medium-duty portable sander weighs 8 lb., 7 oz. and has an over-all height of 7 inches. May also be used as a grinder, as it is designed with cup-type, counter-bored center wheels and cup wire brushes. Available in free speeds of 4500, 5500, 6000, 7200, and 8500 r.p.m. Buckeye Tools Corp., Sales Dept., Dayton 1, Ohio.

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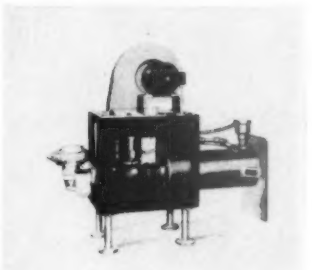

Gas Firing Unit

Gas combustion assembly, called the "Gas Pak," for automatic firing of heating equipment, comprises a blower, burner, mixer, safety equipment, valves, regulator, piping, and wiring, all self-contained in a packaged unit. Manufacturer states that to install, it is necessary only to get the unit in place, connect the gas supply, and plug in electrical connections. Built-in electronic type flame-failure unit closes the main solenoid valve at once in event of pilot flame failure, according to the maker. Quiet operation is said to result from the low velocity of air draft and the use of a nozzle mixing type burner. Suitable for the firing of steam boilers and water heaters, heating plants, industrial ovens, air heaters, and similar equipment. Eclipse Fuel Engineering Co., 733 S. Main St., Rockford, Ill.

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Temperature Indicators

Available in 12½-deg. intervals ranging from 113- to 400-deg. F., temperature-indicating substance may be obtained in crayons, called Tempilstiks®, liquid, called Tem-

Short Cut to better drives!

● Here's the easy way to select the right roller chain drive for your plant. This new stock drive catalog shows you in six easy steps exactly how to choose the chain and sprockets that will deliver the most for your money. Just follow the simple instructions and order the required chain and sprockets from your Baldwin-Rex Distributor. It's as easy as that.

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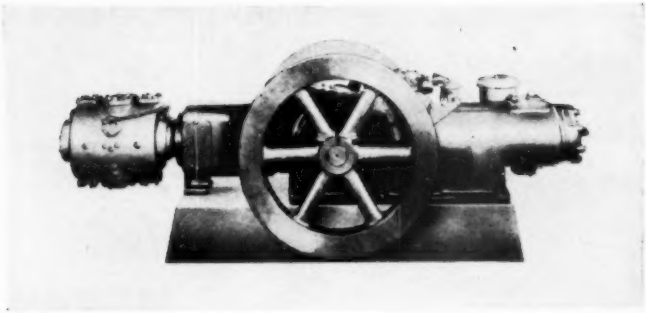

Compressor

Designated Model 0-10S, compressor unit powered by a multi-fuel engine, consists of a single-stage, positive-displacement cylinder driven through a crosshead by a Lorain engine. Designed to operate at 250 to 450 r.p.m., the compressor delivers air or gas at pressures up to 150 p.s.i. The compressor cylinder is equipped with a bottom discharge for gas condensate. The Lorain Model O engine produces from 17 to 34 b.hp., and is designed to operate on diesel oil, clean crude, natural gas, or butane. Manufacturer states that the engine can be converted in the field in approximately 90 minutes. Engine can be supplied with air starting valves or gasoline-driven Lorain friction starter. Unit measures 136x39x48 inches. White-Roth Machine Corp., Lorain, Ohio.

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pilaq®, or in pellets. The crayons and the liquid are available in 50 deg. increments in the range from 400- to 1600-deg. F.; the pellets in 50-deg. increments up to 1700-deg. F. Tempil® Corp., 132 W. 22nd St., New York 11.

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Sweepers

Power sweeper, Model 500, with vacuum attachment, is designed to keep floors free of welding rod butts, nails, chips, and is also equipped with a brush assembly to pick up dirt, paper, and other types of debris. Other features include an air filter, flash arrester to eliminate static charge, and screen filter valve carburetor, instead of the conventional sediment-bowl type. Guide wheel is said to enable the unit to sweep close to machinery and walls without scraping or marring. Equipped with six heavy-duty brushes, a chrome bumper bar, adjustable front suspension wheel, and a sulky on which the operator rides. Wilshire Power Sweep Co., 4615 Alger St., Los Angeles 26.

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Winter Grease

Soft-consistency grease for heavy-duty winter use, known as H Grease O, has a lime soap base, is gold in color, and is suitable for low temperature applications. It is one of a series of greases designed for general purpose industrial service where higher viscosity mineral oils are required than in conventional cup greases, according to the manufacturer. Texas Co., 135 E. 42nd St., New York.

•

Solderless Electric Connectors

Line of solderless electric connectors, said to accommodate a wide range of conductor sizes, features serrated, silver contact surfaces, interlocking sides. Manufacturer states that the use of silver on all current-carrying surfaces results in no oxidation problems, low-contact loss, long life, and low maintenance. The serrated contact surfaces are said to provide high pull-out strength, positive pressure on the cable, resistance to vibration, and a high-conductivity joint. Connectors can be installed without removing nuts from the clamps, and will not twist, distort, or season-crack. Available in straight, tee, block terminal, angle, parallel, and ground types in both Class A-1 and A-2. Expansion bends, busbar and live-line disconnecting clamps also available. Switchgear Div., General Electric Co., Philadelphia.

•

High-Lift Mast

High free-lift mast for three of manufacturer's lift trucks, in capacities from 3000 to 5000 pounds, is said to provide a total lift of 130 inches and a free lift of 65 inches, with lowered mast height of 83 inches. Manufacturer claims that attachment permits good visibility and at the same time maintains standard capacity ratings. Towmotor Corp., 1226 E. 152nd St., Cleveland 10.

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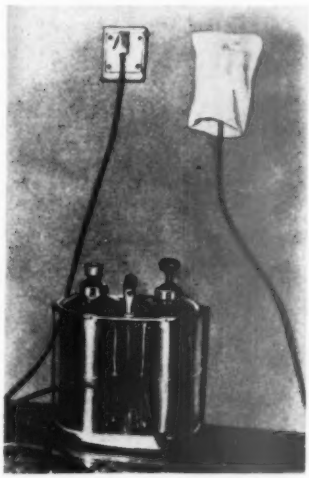

Wall-Washing Attachment

Attachment for use in washing walls, ceilings, moldings, corrugated surfaces, pipe risers, and other irregular surfaces can be used with manufacturer's Wallmaster equipment, or may be obtained as a complete unit with two tanks for cleaner and rinser fluid. The attachment regulates flow of liquid through a valve on a small aluminum plate which fits into the palm. A synthetic sponge, attached to the valve assembly, feeds the cleaning solution and rinse to the surface being cleaned. Sponge is covered with a terry cloth mitt, which may be removed when saturated by dirt, and replaced with a clean one. Mitts are washable, and manufacturer states that they last for months. Quaker Maintenance Co., 124 W. 18th St., New York 11.

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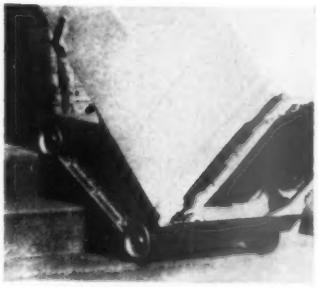
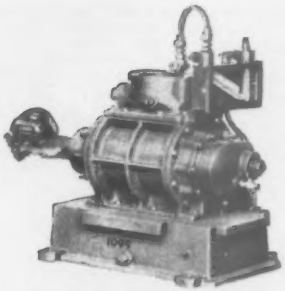


Hand Truck, Crawler Type

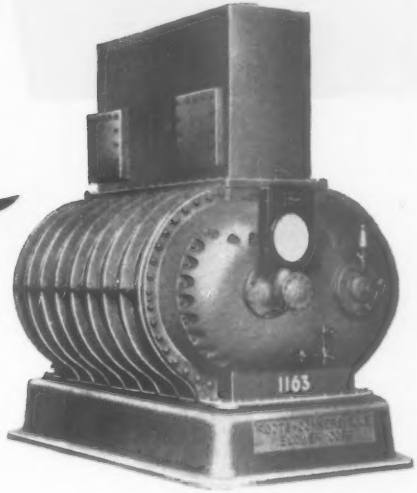
For moving bulky loads weighing up to 500 pounds over uneven surfaces, hand truck called the Trak-Truk, moves on a crawler base or carriage equipped with continuous rubber belts. Load is always carried on the

MEASURE AIR OR GAS WITH

cash-register accuracy



(Above) Small-size R-C Meter with inclined differential gauge, with top inlet, and outlet in bedplate.



Large-size, low-pressure R-C Meter, side inlet box and bottom outlet, with a P.V.T.T. Recorder.

Built-in characteristics of R-C Positive Displacement Meters insure unfailing, long-time accuracy:

1. Accuracy is not affected by variations in specific gravity, rate of flow, pulsation, moisture or impurities.
2. Accuracy does not depend on uncontrollable factors.
3. Accuracy is not subject to adjustment of meter or recorder by operators.
4. Accuracy is not affected by reasonable overloads.
5. Accuracy is permanent because measuring chambers are surrounded by precision-machined cast-iron surfaces.

R-C Meters are built in 31 standard sizes, with capacities from 4,000 to 1,000,000 CFH. Indicating and recording instruments are available for all types. Send for details in Bulletin 10-B-14 or write us about your specific problem.

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•

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Positive Displacement Meters

•

Inert Gas Generators

•

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belts; no metal touches the floor. The continuous belts are said to simplify movement of loads up and down stairs and over curbings, loading platforms, and end gates of vehicles.

When transporting loads on level surfaces, truck is converted into a rubber-tired general utility truck. By retracting the crawler base, the truck may be operated on the lower wheels like any standard two-wheel hand truck, with the belts acting as tires. In operation, the two endless rubber belts with heavy tread run over grooved aluminum wheels.

Lock-type screws adjust the rear wheels forward or back to maintain correct belt tension. Crawler base pivots on two heavy steel plates welded to the tubular truck frame, providing contact for the load-bearing belts regardless of angle. Truck handles, integral with the side frames, are available in different lengths to fit individual needs. American Machine Works, Racine, Wis.

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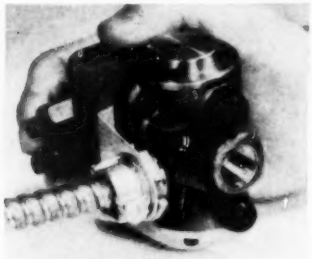

Electrically Controlled Air-Powered Valve

Solenoid-actuated air control valve uses the air it controls to operate the valve. It consists of a cast bronze body incorporating a single air inlet, electrical terminals, and a cylinder in which floates a lightweight piston. The caps enclosing each end of the cylinder hold small 8-volt solenoids, whose plungers, operating through 1/32-in., release the full pressure of the air supply line to drive the piston and thus shift the 4-way shear-flow valve in the desired direction. Manufacturer states that the valve will operate on 5 to 150 pounds air line pressure, and generates very little heat, even at a high rate of speed. The valve is completely inclosed, and it is claimed that it will operate submerged, or covered with coolant, chips, or dust. Valves are adapted to direct connection or remote control of any standard air cylinder. Operating switches may be placed either in the 8-volt secondary circuit or in the 110-volt prmiary circuit. Available in $\frac{1}{4}$- and $\frac{3}{8}$-in. port sizes, and provided with a transformer to reduce normal line voltage to the required 8 volts. Bellows Co., Okron, Ohio.

•

Lubricant

Designed for the lubrication of industrial tableways made of hardened steel, chilled cast iron, or the new laminates, Way Lubricant D is said to eliminate the chattering and jumping effects that occur at the beginning of the tool stroke. Manufacturer states that it is compounded with special additives so that it will not squeeze or press out, either when the machine is in motion, or standing still, permitting the oil film on the way to remain constant. It is said to be non-corrosive to steel and copper, to possess low static and running coefficients of friction and the required tackiness, and not to plug filters. Beacon Laboratories, Texas Co., 135 E. 42nd St., New York.

•

Adjustable Staging Horse

Of all-steel welded construction, adjustable staging horse, called Meco, has clamp screws with metal prongs that embed themselves into the cross beam. Large thumb screw holds the extension bar in position, and a self-locking latch on the bar serves to keep the unit from loosening or coming apart. It collapses into a small unit for storage, and requires no tools or nails to set it up. Marvel Equipment Co., Oshkosh, Wis.

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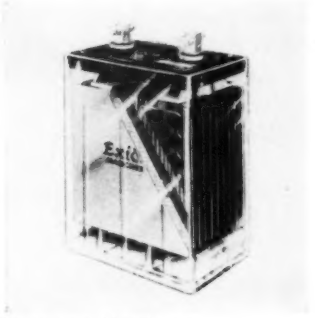

Storage Battery

Known as the Exide-Manchex, storage battery is of the sealed glass jar type, and is said to be applicable as stationary power supply in signaling, telephone, emergency power and lighting, and similar functions. Construction features a positive plate, known as the Manchester type, consisting of a grid cast of a lead-antimony alloy in which the active material is in the form of pure lead buttons, forced by hydraulic pressure into circular openings in the grid. The "Permanized" negative plate is constructed of a lead-antimony grid with a series of vertical ribs connected by short horizontal bars, extending part way through the plate. The active material is in the form of strips or ribbons of sponge lead, extending from top to bottom of the plate between the ribs and locked in position by the horizontal bars. Molded glass jar in which the battery is assembled permits ease of inspection and maintenance. Available in a variety of sizes and capacities, from 40 to 960 ampere hours. The Electric Storage Battery Co., 19th St. & Allegheny Ave., Philadelphia 32.

•

Steel-Wood Lockers

Line of steel-wood lockers feature framework and floors made of steel, with all other parts made of steel reenforced Masonite. Number plates fit in recessed chrome-finished handle. Lockers are made in both single and double tier, in standard sizes. Accessories include steel sloping tops and closed bases. Available with or without legs. Lyon Metal Products, Inc., Aurora, Ill.

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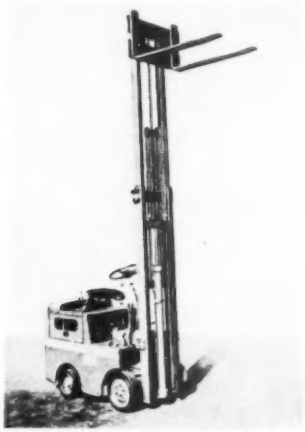

Lifting Attachment for Fork Truck

High-lift low-clearance device, called the Hi-Lo-Stack, is designed for use on manufacturer's Clipper model fork-lift trucks, both gas-powered and electric battery-powered, of 2000-lb. capacity. When mounted on the truck, device permits an over-

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all collapsed height of 83 inches, a maximum lift of 130 inches, and a free lift of 64 inches without increasing the over-all height of the machine, according to the manufacturer. This permits the loaded truck to pass through 7-ft.-high openings, and to tier unit loads to the ceiling in boxcars with low clearance, or to 130 inches in storage and warehouse areas. Features include a single hydraulic lift-cylinder and a single set of uprights. Clark Equipment Co., Industrial Truck Division, Battle Creek, Mich.

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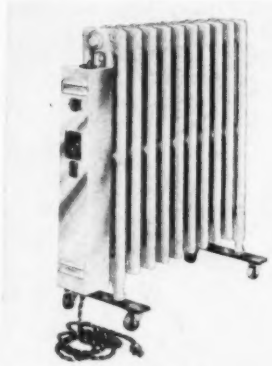

Steam Radiator

For electric heating system in plants that generate their own electricity or obtain low rates, and for use in working areas which cannot economically be heated by any other way, electric steam radiator is thermostatically controlled, and shuts off automatically when preset temperature is reached. Unit heats by radiation and convection, and holds heat for some time after it has been shut off. Made of rust-resistant cast iron, it is said to be safe for use anywhere because it does not absorb oxygen from the air and has no exposed wires. Available in portable and stationary models, in six sizes, 110-220 volts, a.c.-d.c. Koral Electric Mfg. Co., 43-22 Van Dam St., Long Island City, N. Y.

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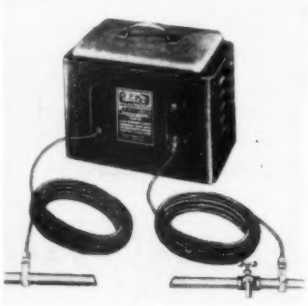

Pipe Thawing Device

Portable electronic device for thawing frozen water pipes operates from any 110- or 220-volt, 50- or 60-cycle a.c. line, is said to thaw frozen pipes even when embedded, without cutting holes in walls or floors of buildings or digging up the ground outside. Device is equipped with 40 feet of output cables, 10 feet of power cable, and pipe clamps. Trindle Products Co., 17 E. 23rd St., Chicago.

•

Roll Handling Power Truck

Power truck, with a capacity of 2000 pounds, picks up, moves, and deposits rolls in a vertical position. Two clampers are lined with self-centering, rubber-lined grip pads which close by adjustable tension springs controlled by the operator. The arms are opened hydraulically, but are equipped with a safety device so that should loss of hydraulic pressure occur, the load will not drop. The holding of the load in transit, or while stacking, is entirely independent of the hydraulic system. Roll clamper is adjusted for rolls of varying diameters by a lever on the back of the carriage which adjusts the positioning pads. A deadman-type hand lever on the control cab locks clampers in any position, allowing operator full use of his hands for other operating controls. Hydraulic roll clamper attachment can be added to any of manufacturer's power fork trucks, gasoline, electric, or gas-electric driven. Lewis-Shepard Products, Inc., 282 Walnut St., Watertown 72, Mass.

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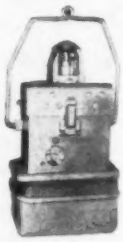

Gas Warning Device

Designed to flash a red signal light when a dangerous concentration of combustible gas is present in the surrounding air, warning device, called M.S.A. Explosilite, serves as a safety guard for maintenance or repair workers in storage tanks, vaults, manholes, and other confined space. It is approved by the U.S. Bureau of Mines for use in atmospheres contaminated with methane. Device may be preset for a specific

100,000 Hours

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OVER 14 YEARS AGO, 66 complete *Texrope* drives were installed in New York's famous RCA building . . . on air-conditioning equipment for the NBC radio studios. Today, some of these *original* V-belts are still running, 20 hours a day, week in, week out!

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Send for Pre-engineered Drive Manual — Lists stock components to cover 90% of V-belt drives. See your A-C dealer or District Office, or write direct for bulletin 20B6956. Also in Sweet's.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A 2614

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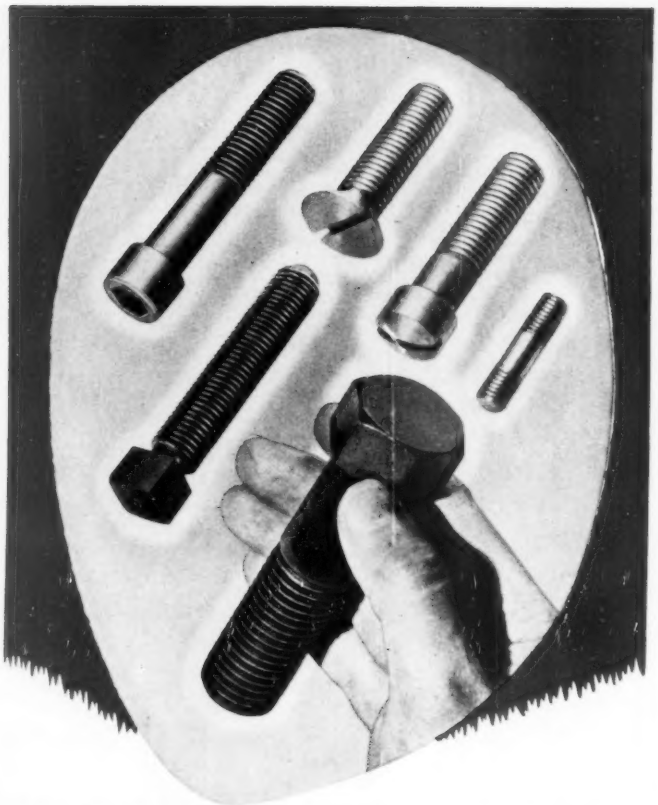

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assures you extra accuracy, extra rigid inspection, extra fast delivery

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ORIGINATORS OF THE KAUFMAN DOUBLE EXTRUSION PROCESS

Specialists for more than 30 years in

CAP SCREWS, SET SCREWS, MILLED STUDS

Ask your jobber for Cleveland Fasteners

concentration of natural gas or petroleum vapors. It operates automatically, continuously sampling the air of a working place, and manufacturer states that it requires no training or skill on the part of the user. Current is supplied by an Edison nickel-iron battery which will operate the instrument for 18 to 20 hours. The unit is tamper-proof, and can be opened for adjustment only by authorized personnel equipped with a special magnet. Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8.

•

Portable Cutting Tool

Called the Nibblex, portable sheet metal cutting tool can make circular cuts with radii as small as 1 inch and may be used in inaccessible places, according to its maker, who states that it is capable of cutting sheet metal up to 20 gage (0.040-in.) without bending, burring, or stretching the metal. It also cuts corrugated sheet, plastic sheet, and pipe. It weighs 13 ounces, and can be fixed in the chuck of any ¼-in. drill. Nord International Corp., 130 Greenwich St., New York 5.

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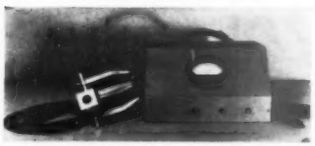

Bar-to-Bar Armature Tester

Developed for indicating and locating shorts in armature windings, electronic bar-to-bar tester is a compact testing device containing two sections: a vacuum tube oscillator section which generates 8000 cycle a.c. voltage of about 15 volts, no load, and an electronic voltmeter section which has an output impedance of 500,000 ohms to the vacuum tube amplifier. It is equipped with a lightweight test prod unit which can be adjusted for various commutator diameters and bar spacings, and cathode ray or magic eye indicator mounted on the test prod to facilitate rapid testing. Manufacturer states that tester does not have to be recalibrated when a tube is replaced, nor does it require specially selected tubes for the oscillator section, as all tubes are popular

How to Build Links at Less Cost with Arc Welding

The links and clevises shown above are typical of the many different kinds of machinery component parts that are being fabricated today at less cost with arc welding than with other methods. Welded steel parts like these are decidedly stronger and more rigid, yet require considerably less material to build. Amazingly simple in design, welded steel machinery parts can be produced efficiently in all quantities using steel plate and standard mill shapes and forms.

More detailed data on the design of links and other machinery parts for arc welding is contained in the "Procedure Handbook of Arc Welding Design and Practice." Price $1.50 postpaid in the U. S. A., elsewhere $2.00.

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CUT YOUR TOOL INVENTORY AND LOSSES...

. . . Skinner Chuck stopped 'em and job delays, too, with McCaskey

No one wants to run up costs by carrying more tools than necessary in tool crib inventories. But . . . how be sure that you have enough to serve daily production needs . . . and not too many?

The Skinner Chuck Company, New Britain, Conn. found the answer and made these and other definite savings thru McCaskey Tool Crib Control, according to Clifford L. Nelson, General Foreman:

(1) A large reduction in inventory carried in the tool crib . . . with more tools actually available for use than before;

(2) Inventory and Activity records prevent having to hold up jobs waiting for the purchase of tools;

(3) Employees like the McCaskey System because there can be no question about the tools they are responsible for and no arguments when they are returned;

(4) All tools are quickly located whether in use or in the crib saving time for planners, supervisors, operators and machines;

(5) A large reduction in tool breakage and total elimination of loss of tools, that formerly disappeared in the scrap can, results from having complete accountability and knowing the reasons for tool breakage.

Let us have a qualified representative explain how McCaskey Control will save from the start in YOUR plant . . . or send you proof of McCaskey savings in several other well-known plants.

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THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

types. Device is mounted in a 13x8x8-in. metal case. It weighs 23 pounds, and operates on a power supply of 110 volts, 60 cycles, a.c. National Electric Coil Co., 794 Chambers Rd., Columbus 16, Ohio.

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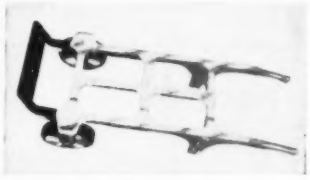


Hand Truck

Multi-purpose hand truck called the Aerotruker needs no greasing, as its rubber-tired wheels are equipped with Timken tapered roller bearings, factory-packed with waterproof lubricant. Heavy-duty cast single-unit frame is constructed of light-weight aluminum alloy. It is corrosion resistant and can be made spark-proof. Aerol Co., Inc., 2820 Ontario St., Burbank, Calif.

•

Portable Fluorescent Lamp

Equipped with a heavy-duty 25-ft. extension cord, portable fluorescent lamp operates on 110 to 125 volt, 60-cycle a.c. current, consumes 8 watts. Called the Sylvania fluorescent portable lamp, unit measures $10^{1}/_{4}$x$1^{5}/_{8}$x$1^{7}/_{8}$ inches. The 6-watt fluorescent bulb is replaceable, and has a life expectancy of approximately 2500 hours, according to the manufacturer. Rotating hook provides a means for hanging light where most needed, and a reflector directs the light onto the work. Ballast control is 3 feet from the attachment plug, switch is built into the lamp housing. A pair of bracket clips supplied with each unit permits installing as a permanent fixture when desired. Auto-Test, Inc., 1450 S. Michigan Ave., Chicago 5.

•

Turbine Pumps

Line of medium-duty turbine pumps is suitable for use in water supply, condensate return, and boiler feed

IF SEEING IS BELIEVING *You* BE THE JUDGE

Builders of Multiple Spindle Automatic Bar Machines emphasize the importance of substantial FRAME SUPPORT to *maintain* accurate, dependable, low-cost machine performance.

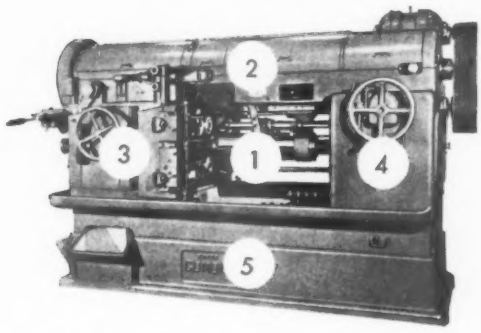
CONE long ago recognized this fundamental requirement and *did* something about it. In 1924 — in the CONOMATIC — an exclusive design of frame was introduced, a frame that made possible new and unequalled records for automatics in heavy duty forming and deep hole drilling operations, a frame that required no *redesigning* when carbide tools came along, and, a frame that remains today a standard for comparison in consistent, low-cost operation and maintenance.

CONOMATIC users benefit from the advantages of the CONOMATIC FRAME DESIGN, but you do not have to be a user to SEE WHY.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Why not use a chart to guide your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask your Cone representative.



(1) TOOLING AREA

of Conomatics is of horizontal type, open, roomy, well supported. The operating controls are adjacent and on both sides of the machine. All tool slides are exceptionally well built and supported by liberal bearing surfaces, with convenient means of adjustment; all tool slides are designed to accommodate quickly and maintain more substantially a general choice of various types of tools — for standard or special applications. Quick change pick-off gears, for work spindle speeds, tool feeds, and rotating tool spindles, are provided for an exceptionally wide range of work; they are positioned to save time and motion in change-overs.

(2) TOP SUPPORT

of Conomatics is the revolutionary "top bed", which identifies all Conomatics. It houses the single unit camshaft and centralizes all cams in a truly accessible, visible, quick-change, chip-free position, clear of the tooling area. Conomatic cams provide a smooth, powerful, synchronized drive to all tool slides and power operated mechanism.

(3) HEADSTOCK SUPPORT

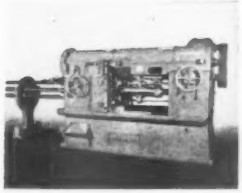
of Conomatics is a very substantial, triple unit support to the work holding and stock feeding members of these machines. It is the only multiple spindle automatic bar machine headstock support with an adjustment provision of both axial and radial take-up for the front bearing of the carrier.

(4) GEAR BOX SUPPORT

of Conomatics is a heavy-set unit that transfers and distributes power to the various functional mechanisms of the machine. It gives open-end facility to tool feed and attachment drive-gear change. It provides "direct drive" to all main toolslide attachment positions.

(5) BASE SUPPORT

of Conomatics is a massive, cam-free, bridge construction type of base member that supports the tooling area up close to the work and tool axis. It has a larger cubic foot capacity for chips and cutting coolant. Its size and weight is an important combination in the over-all support and maintenance of alignment that only Conomatic Frames can give to tools and work.



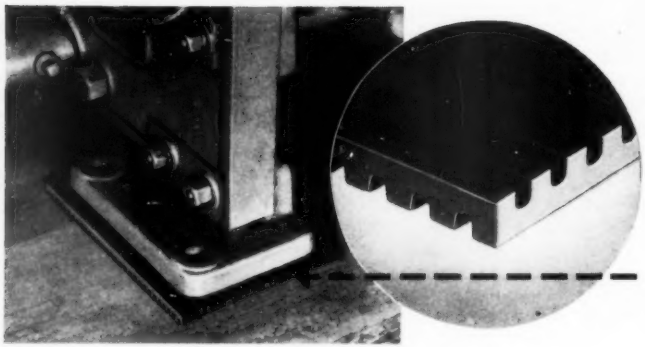
A comparison with ALL Automatics will lead you to

#3

Conomatic}

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

How to take the "Wear and Tear" out of VIBRATION



...and look at the results you get with these ISOMODE* PADS

You're sure to improve operations and save money by controlling vibration and impact. For experience has shown in countless cases how hard strains and stresses are on machine adjustments, on men, on buildings. Now, you can lick the problem economically with Isomode Pads. From the oscillograms taken at a typical installation, you can actually see the great reduction in vibration transmitted to the floor!

Isomode Pads are effective under practically all machines. The more machines they're used under, the more noticeable the improvement. No nerve-wracking jars! Less noise! You conserve manpower efficiency, protect accuracy of machines. *In most instances, you can eliminate bolting to floor or special bases.*

Use Isomode Pads under *any* weight of machinery. A 30,000 pound press? Pads are ideal! A 50 pound bench tool? Pads do a job there, too! Merely cut them to area required from standard sizes up to 18"x18"— with ordinary hand shears.

Why not try some under a troublesome piece of equipment? You'll see for yourself the same, outstanding performance that is satisfying users in over *5000 installations!* **Write for this bulletin!**

BEFORE: Oscillogram of floor vibration. The loom was bolted to a wooden floor, to keep it from "walking," and the vibration of the floor was transmitted to adjoining areas.

AFTER: On Isomode Pads, the loom transmitted negligible disturbance, as evident in this oscillogram, taken at the same point. Noise was tremendously reduced — and no hold-down was required.

* *Reg. U. S. Pat. Off.*

THE MB MANUFACTURING COMPANY, INC.
1060 State Street, New Haven 11, Conn.

service, or any application where non-viscous and non-abrasive liquids are handled against moderate pressures. The capacities available are 2 to 10 g.p.m. and 20 to 100 head feet in water at 1750 r.p.m.; or 2 to 8 g.p.m. and 100 to 200 head feet in water at 3450 r.p.m. Impeller, the only moving part, is mounted on a stainless steel shaft which turns on two ball bearings, providing quiet, non-pulsating performance, according to the manufacturer. Roy E. Roth Co., Rock Island, Ill.

•

Lightweight Fork Truck

Because of its light weight and low collapsed height, fork truck, Model FF, is suitable for use in cramped quarters and in locations where heavy loads present a problem. Made in 1000- and 1500-lb. capacities, both models measure 51¼ inches from face of forks to the rear, have a collapsed height of 78 inches, and lift to 134 inches, with a "free" lift of 68 inches before telescopic mechanism is extended. They have a permanent 2½-deg. tilt at the centering point, retracting the load over the wheels. Tilt while lifting is 10 degrees backward and 5 forward. Two standard batteries provide power. The 1000-lb. unit, designed for a 30-in. load, is 27¾ inches wide, weighs 2360 pounds, and when rated for a 48-in. load, weighs 2623 pounds. The 1500-lb. model is an inch broader, and weighs 2836 pounds. Automatic Transportation Co., 149 W. 78th St., Chicago.

•

Protective Coating

Developed for protection of machinery, processing equipment, and for general factory maintenance, high solids synthetic paint is said to protect metals, wood, and ceramic surfaces against chemical attack by corrosive fumes, condensates, or spillage. Called CycLon Series NPC, substance air-dries quickly by solvent evaporation to an adhesive, hard wearing, flexible glossy coating without the necessity of priming the surface being coated, according to the manufacturer. It is claimed that coverage is from 350 to 450 square

Maximum speed of assembly reduces costs—helps you get *True Fastener Economy*. The *accuracy* and *uniformity* of RB&W Carriage, Machine and Lag Bolts are the products of more than a century of continuous research and progressive development in fastener manufacturing . . . backed by the skill of four generations of RB&W men and women.

R B & W

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Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Oakland, Portland, Seattle. Distributors from coast to coast.

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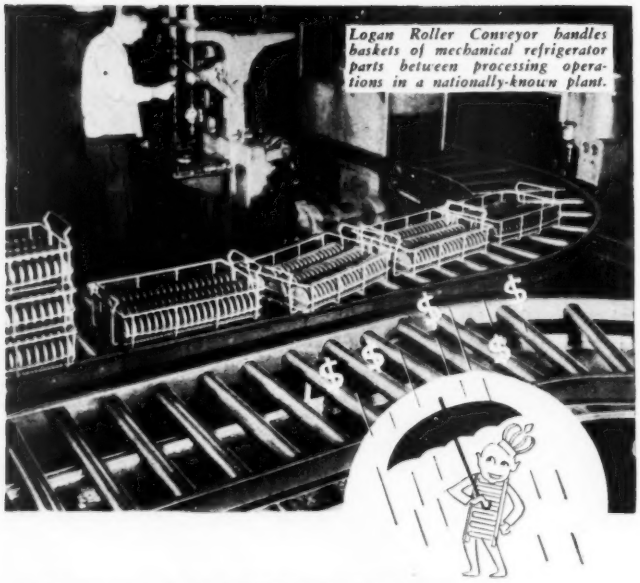
RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY


Logan Roller Conveyor handles baskets of mechanical refrigerator parts between processing operations in a nationally-known plant.

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. . . and that's why, more and more, Logan Conveyors are becoming an integral part of production systems. Handling *is* such a large part of today's shop processes that savings here are reflected immediately in lower costs, increased production, better quality. In the months, and years, just ahead every indication points to keener competition and therefore the necessity for cost-paring to the bone. Now, if ever, is the "time to conveyorize."

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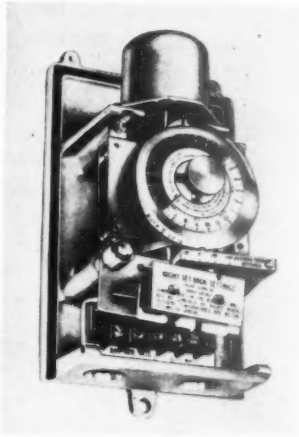
Logan Conveyors

LOGAN CO., INC., 510 CABEL ST., LOUISVILLE 6, KY.

feet of area per gallon per coat, and coatings maintain their flexibility over a wide range of temperatures, and are suitable for applications to 180 degrees F. Munray Products, Inc., Div. of Poly-Cyclo Products Co., 12400 Crossburn Ave., Cleveland 11.

•



Temperature Control

For automatic control of night set back of building temperature, control device called "Weather-Chron" may be wired into the regular room thermostat circuit. Switch may be installed on the outside of the building, and set for the time the build- is to be warm every morning. The shutdown time is set at the earliest time heating may be shut down in the evening in mild weather. Manufacturer states that the device anticipates the building's needs for heat and automatically changes the time heating starts each morning and shuts down each evening as the weather changes. During the day, the regular room thermostat maintains building temperatures at the desired level. A low night stat may be used as a low-limit control. It is claimed that on extremely cold nights, when outdoor temperatures drop below a preselected level, build- temperatures will be held at the daytime level throughout the night. All heating is eliminated in mild weather when outdoor temperatures rise above the 65 degree F. level. Unit may be used directly with any existing thermostatic controls. Weather Controls Division, Automatic Devices Co., 53 W. Jackson Blvd., Chicago 4.

•

Insulating Varnish

Internal-curing insulating varnish, known as Harvel 1012C, was developed for the impregnation of wound structures requiring good mechanical bonding strength, although it can also be used as an all-purpose varnish. Suitable for the treatment of windings operating at high peripheral speeds and for those subject to great stressees. It is said to be fast curing, resulting in a cured film that is oil-proof, resistant to chemicals and moisture, as well as

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TRANSITE* Industrial Vent Pipe was selected for this laboratory venting system because it resists the corrosive effects of many vapors, gases, fumes . . . because it will provide effective and economical venting service for years to come.

Transite makes up into neat, efficient venting systems for a wide variety of industrial uses. As vents, ducts, stacks, this asbestos-cement pipe is quickly and economically installed . . . is light, strong and durable. It is readily workable—can be cut and drilled on the job. Rustproof, it needs no painting whether used indoors or out.

Transite Industrial Vent Pipe comes in a range of sizes up to 36" in diameter. The full line of Transite fittings meets practically any job requirement and assures a venting system which is corrosion-resistant throughout.

For further details, write for Data Sheet Series DS-336. Address Johns-Manville, Box 290, New York 16, N. Y.

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Typical industries in which Transite Industrial Vent Pipe is used:

Aircraft	Dairy	Gas	Petroleum	Shipbuilding
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Baking	Electrical	Laboratory	Pulp & Paper	Smelting
Bleaching	Explosive	Laundry	Quarrying	Soap
Boiler Works	Farm Machinery	Leather	Railroad	Soft Drink
Brewing	Food	Meat Packing	Rayon	Sugar Refining
Canning	Foundry	Metal	Refrigeration	Textile
Ceramic	Furnace	Mining	Rubber	Tool
Chemical	Furniture	Paint	Sewage Works	Water Works

*Reg. U. S. Pat. Off.

Johns-Manville
TRANSITE Industrial Vent PIPE

to decomposition under high temperature operating conditions. In its shipping consistency, the varnish is said to produce a film thickness of approximately 0.0025 inch, and can be maintained at the proper consistency with VM & P naphtha. Irvington Varnish & Insulator Co., Irvington 11, N. J.

•

450-Watt Soldering Set

Portable light-duty soldering tool, called Thermo-Grip, operates on the resistance heating principle. Manufacturer states that touching the work with the soldering tool completes the secondary power circuit and causes the part touched to heat almost instantly. A thumb switch permits close heat control, draws current only when tool is in contact with the part to be soldered. It is particularly suitable, according to the manufacturer, for use in inaccesible places and flammable surroundings. Attachments include a plier-like tool for sweating and unsweating copper tubing, soldering lugs, terminals, and similar work; a fork attachment with two 3-in. electrodes for reaching into restricted places, such as in switch boxes, electrical tools, and equipment; a pencil attachment with one 3-in. carbon electrode for spot soldering, and light seam soldering. Attachments have lightweight phenolic handles; electrodes are replaceable. Carrying case measures $9\frac{1}{2}$x6x$8\frac{3}{4}$ inches, including storage space for attachments; weighs 16 pounds. There are two soldering heats: high, 5.3 volts, and low, 4.2 volts. Equipped with an on and off switch and a pilot light to indicate when current is on. Ideal Industries, Inc., Sycamore, Ill.

•

Plate Clamp

Steel plate clamp, for handling plates $\frac{1}{4}$ to 2 inches thick, operates on the principle that the heavier the

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Oust fumes, heat, dust with Ilg

When you clear the air in your plant, you clear the way for improved worker morale and increased efficiency. Ilg blowers and fans — distributed by Graybar — are the most efficient, best-built ventilating units you can buy. For each of your ventilating needs, there's a standard Ilg unit that's "made to order."

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If you do not already use EDISON, get a current price quotation —you will probably find initial cost *much lower* than you think. Couple this factor with well-known EDISON long life and you will have the key to year-after-year economy.

ADVANTAGES OF EDISON NICKEL-IRON-ALKALINE BATTERIES: They're mechanically durable; electrically foolproof; quickly and easily charged; simple to maintain; not injured by standing idle.

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STORAGE BATTERIES

EDISON STORAGE BATTERY DIVISION
of Thomas A. Edison, Incorporated, West Orange, N. J.
In Canada: International Equipment Co., Ltd., Montreal and Toronto

plate, the greater the leverage, the tighter the grip, states the manufacturer. Called the Marbo-Clamp, device measuring 9x12 inches, is made of flexible alloy steel. Gripping teeth are hardened to prevent tooth breakage or chipping. Wire attaching rope is included. Marbott Weld Co., 4389 Martin Ave., Cleveland, Ohio.

•

Portable Disk Sander

Designed with vertical type spindle construction for fast, easy operation in difficult places, portable electric disk sander is available in 7-in. heavy-duty, and 9-in. standard-duty models. The rear grip of both models is positioned to maintain correct balance in any working position, according to manufacturer. Side handle is removable and can be attached to either right- or left-hand side. Trigger switch has positive lock for continuous operation. A spindle lock is provided for quick pad change. Both models are powered with a universal 110-volt motor, which drives the tools at 5200 r.p.m., no load speed. Lightweight aluminum housing completely encloses the tool. Weight of the 7-in. model is 10 pounds; the 9-in. standard-duty model, 11 pounds. Equipment furnished includes 15 feet of rubber-covered three-conductor cable with plug and cable strain reliever; one backing pad; three sanding disks. The Bradford Machine Tool Co., 657 Evans St., Cincinnati 4.

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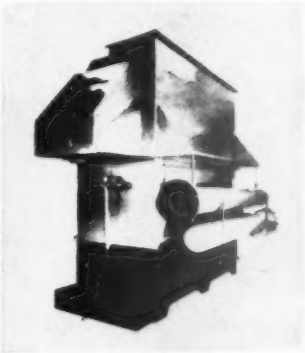

Cooling Device for Compressed Air, Gas

Equipment, called Aero After-Cooler, is designed to dehydrate com

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- LONG SERVICE LIFE
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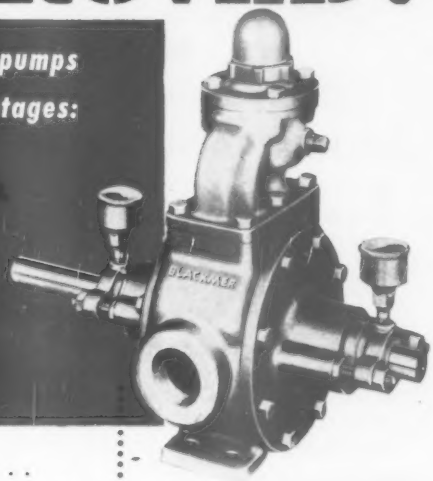

MODEL 1203: Pump with removable liner. Made in capacities from 10 to 750 GPM. For general industrial use. Handles pressures to 100 PSI and liquids up to 600° F.

What do *you* look for in a pump? Dependability? . . . All Blackmer pump parts are designed with an exceptionally high factor of safety for *extra* dependability. Rated capacity? . . . Blackmer pumping elements which are self-adjusting for wear assure continuous full delivery. Elimination of costly shutdowns? . . . Simplicity of Blackmer design makes maintenance quick, easy and inexpensive. Blackmer performance, sturdiness and economy have been *proved-in-use.* Make your own comparisons. Get *all* the facts. Telephone your Blackmer representative, or write:

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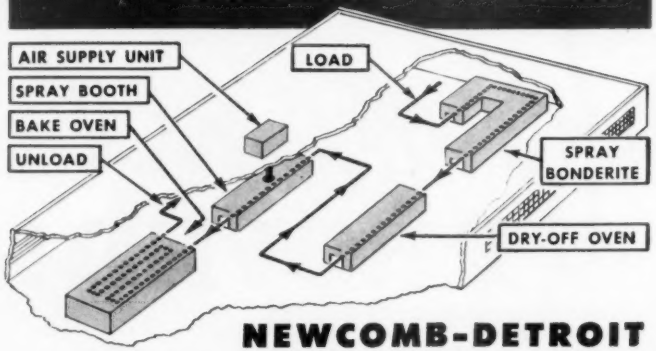

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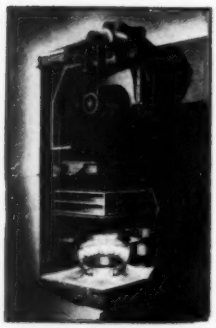
for **PORTABLE DISH WASHERS**

Every piece of equipment in this finishing system was pre-assembled and factory-tested for performance prior to shipment from the Newcomb-Detroit plant. Even the air supply system is pre-assembled and stationed on the plant roof to save space.

The system is used to rustproof (in the six-station spray bonderite section), spray paint (white synthetic enamel) and bake portable dish washers in the eastern plant of one of the world's largest appliance manufacturers. The entire system was designed, built and installed by Newcomb-Detroit and the pre-assembly technique used saved many man-hours in field assembly and try-out as well as the usual long disruption of plant production.



This is the pre-assembled Uni-Wash Air Supply unit installed on the roof. It is a compact, complete system in one unit. Available in a wide variety of capacities.

This is typical of Newcomb-Detroit engineering and construction. And they have applied this ingenuity to finishing systems for all types of industries during the last thirty-five years. Why not drop a line for your Newcomb representative to drop in and discuss your finishing problem? No obligation . . . just write Newcomb-Detroit, 5743 Russell St., Detroit 11, Michigan.

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pressed air or gas by cooling it to a temperature below the dry bulb temperature of the atmospheric air, removing the moisture that condenses at that point, and preventing further condensation of water in air or gas lines in use. Recirculating water spray is evaporated on the surface of a coil through which the compressed air passes, creating a temperature close to the wet bulb temperature of the surrounding atmosphere, lower than the dry bulb temperature, and below the summer surface water temperature. Protection against freezing is provided by the use of a thermostat in the spray water reservoir, set for a desired low-temperature limit at which it operates dampers to recirculate the air stream internally around a division plate in the center of the unit instead of drawing in freezing air. Niagara Blower Co., 405 Lexington Ave., New York 17.

•

Metal Bender

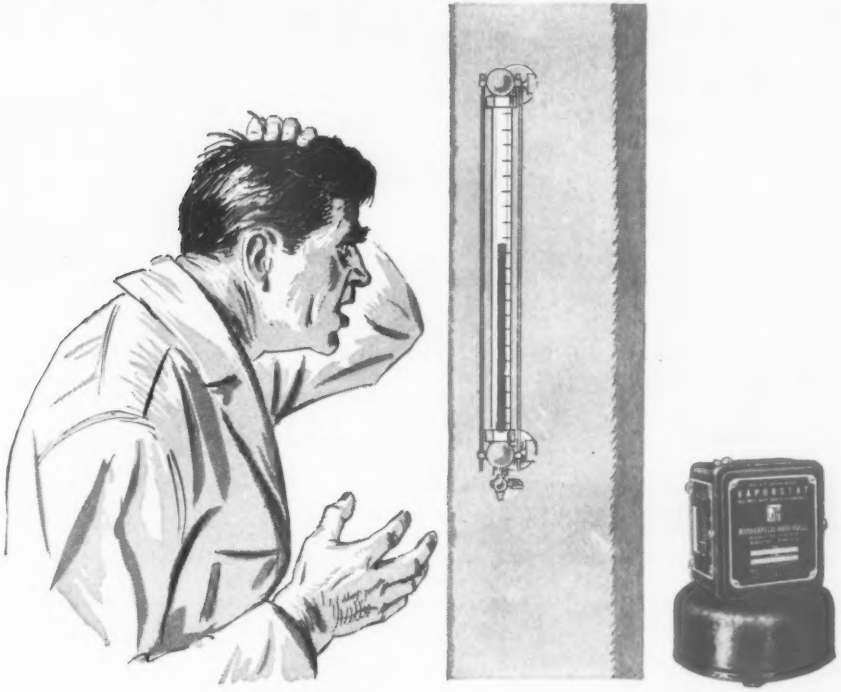
Cold bends of copper, aluminum, brass, and mild steel bar and strip through sizes from ⅛x1-inch to ½x6-inches may be made on the job with device called Form-Bar Bender, according to its maker. The bender is portable, is said to be so simple to operate that no special training of workman is required, to make up, down, and sideways bends, and twists. Short offsets and "Z" bends can also be made, and the device may be set up for repeated duplicate bending. A vertical mounting position is said to make the tool flexible for handling long material. Winfield R. Scott, 234 S. 11th St., Newark 7, N. J.

•

Air Conditioner

Console-type room air conditioner, known as the 51H2 DeLuxe, is of 1-hp. capacity. Features include an exhaust control for the removal of stale air and smoke and a quiet, two-speed fan for draftless air distribution. Refrigerating compressor and motor are hermetically sealed for noiseless operation. The compressor starts unloaded, requires low starting current. Control panel consists of two knobs concealed behind a hinged cover on the front of the cabinet. The left knob is a switch which turns on the complete air-

Does Feedwater Level Keep You On the Run?



Make It Automatic with the Honeywell Vaporstat

Manual Feedwater Level Control can keep you on-the-run checking readings and starting pumps . . . but if it is automatic you can cross it off your worry list.

The Honeywell Vaporstat provides completely automatic control of Feedwater Storage Level in one self-contained, easily mounted unit . . . and costs as little as $20.00 for the average installation. Acting on a column of air which measures the static pressure of the water level, the Vaporstat is set to make and break an electric circuit which controls the operation of the pump. Audio or visual alarm can be used with the system to warn of need for make-up water.

Write for Catalog 8302 on the Vaporstat and other Honeywell Control Devices designed to save you time, labor, and money.

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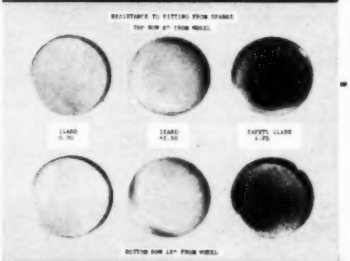
SHATTER-PROOF—I-Gard Safety Lenses will withstand the severest blows which would shatter the toughest glass safety lens. They are absolutely shatter-proof; will not splinter or chip.

FEATHER-WEIGHT—Less than half the weight of optical glass, I-Gard Safety Lenses bring new wearing comfort to the bridge of the nose. Workers will wear them.



ABRASION-RESISTANT—I-Gard Safety Lenses resist pitting from spark streams, produced by a Brown & Sharpe Auto Surface grinder operating at 5600 RPM.

Each year on-the-job eye-injuries cost industry about $20,000,000. Certainly, more efficient and more economical eye protection is urgently needed.

To meet this need, modern optical research has developed the absolutely shatter-proof abrasion resistant, I-Gard Safety Lens. Now you can **reduce accidents, increase production, improve worker morale** with a safety lens workers will wear.

Never before has one type safety lens offered all these eye-protective, money-saving, features: shatter-proof, feather-weight, anti-fogging, resistant to chemicals, abrasion, glare, heat and humidity. Available in both prescription and plano form, providing a complete industrial service.

Partial protection is not enough . . . for **complete** eye protection, specify I-GARD SAFETY LENSES.

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Name _____

Company _____ Title _____

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City _____ State _____

conditioning system. The right is a selector which controls fan operation at high or low speed for ventilation, or can be reversed to exhaust to the outside. Space is provided in the center of the panel for a thermostatic control knob for automatic operation. Standard model operates on 230- or 208-volt, single-phase, 60-cycle current, but may be obtained for operation on 115-volt d.c. Cabinet over-all dimensions are 40x34x21 inches. Carrier Corp., Syracuse, N. Y.

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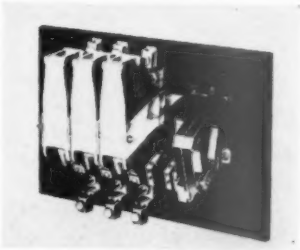

Magnetic Contactors

Intended for motor, heater, and lamp control, 150- and 300-amp. a.c. magnetic contactors, Bulletin 4454, Size 4, and Bulletin 4455, Size 6, feature identical and interchangeable movable and stationary contacts. The cold molded arc shields for all main poles are removable. Magnetic circuit is said to permit operation over a wide range of line voltages. Connectors for line and load terminals are the solderless clamp type, and mounting panels are standard. Size 4 contactors are available with a maximum of 5 main poles and Size 5 units with 2 or 3 poles only. Both sizes can be supplied with open type construction or with NEMA Type 1 enclosures. Coils are obtainable for operation on 110, 208-220, 440, and 550 volts on frequencies of 25, 50, or 60 cycles. The maximum inclosed power rating for Size 5 contactors is 200 horsepower, 550 volts, 3-phase, 60 cycles. Ward-Leonard Electric Co., Mt. Vernon, N. Y.

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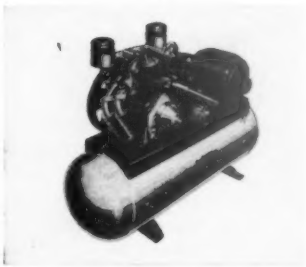
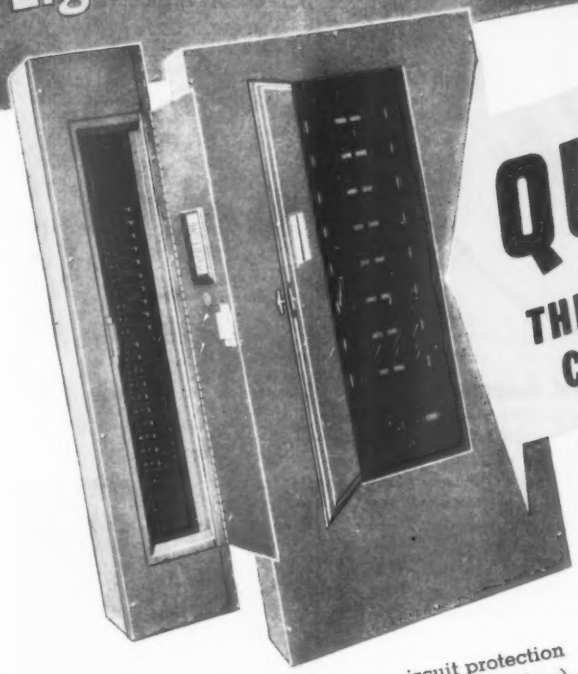


Air Compressors

Two sizes of air compressors, Model W-6308-H, in 7½- and 10-hp. units, provide 30 and 40 cubic feet displacement, respectively at 175 pounds pressure, and 37 and 50 cubic feet displacement at 100 pounds. They are 4-cylinder V-type units, mounted on bed-plate only or on 80-gal. tanks. The bore and stroke of the low-pressure cylinder is 4¾x3 inches. A

SQUARE D
Lighting and Power Panelboards
FEATURE



QUICK TRIP MAKE BREAK
THERMAL- MAGNETIC CIRCUIT BREAKERS

GIVING 2-WAY CIRCUIT PROTECTION

1 THERMAL TRIP
Holds harmless momentary overloads, but opens circuit if overload continues.

2 MAGNETIC TRIP
Quickly opens circuit on "short."

FUSES ELIMINATED—2-way circuit protection is provided by thermal-magnetic (coilless) trip elements which need not be replaced after operation...common trip disconnects all lines, preventing single phasing . . . anyone can quickly restore service after cause of tripping has been removed . . . no live parts are exposed...compact mechanism is built for frequent operation under heavy load.

ML CIRCUIT BREAKER LIGHTING PANELBOARDS are either standard width or narrow column type. Flush or surface mounting. Up to 42 circuits. 15 to 50 ampere branches. Lugs only or circuit breaker mains.

ML CIRCUIT BREAKER POWER PANELBOARDS are either standard width or narrow column type. Flush or surface mounting. Any combination of 15 to 600 ampere branches. Lugs only or circuit breaker mains. Maximum 250 volts D. C. or 600 volts A. C.

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Do you recognize these HOLTITE fastenings? Guess what industry uses each of them. Check yourself by the list below.

CONTINENTAL makes them all and thousands more

Of all the 400,000 varieties of fastenings that literally hold our industries together, Continental makes a large proportion marketed under the famous HOLTITE trade name. Most of them are standard — screws, nuts, and bolts for every use in every industry. Others like the well-known HOLTITE-Sems and HOLTITE-Phillips screws are patented specialties and the famous HOLTITE-Thredlock, Locktite and Tap screws were first designed and produced by Continental. Sometimes a fastening engineered by HOLTITE for one industry finds an unexpected use in another. Often a HOLTITE-*Engineered* fastening will replace several parts that a manufacturer is using. Why not discuss your fastening requirements with a Continental Sales-Engineer. He will focus on your requirements all the broad industrial-fastening experience and ingenuity of Continental. Remember Continental is constantly improving HOLTITE products, lowering their cost and broadening service.

ENGINEERED FASTENINGS FOR PRODUCT ENGINEERS

A. A typical flat head HOLTITE steel woodscrew. Continental makes a complete range of sizes with either slotted or Phillips heads.

B. Special Phillips "HOLTITE-Thredlock" door hinge screw eliminates lock washers and other locking devices giving improved performance when subjected to vibration.

C. Dial adjusting screw specially designed for bathroom scales. Screw inserted in frame is swaged against square shoulder under head. Completed part engages scale leveling mechanism to allow screw driver adjustment.

D. Beater drive shaft for a home electric mixer. Continental engineered this unusual part and produced it economically by cold heading process. Head end is welded to the beater unit. Knurled section provides grip for motor chuck.

This Trademark HOLTITE T. M. REG. U. S. PAT. OFF. *means made by—*

CONTINENTAL SCREW COMPANY

1904 NEW BEDFORD, MASS., U.S.A. 1949

centrifugal unloader is standard equipment. The 7½-hp. model operates at 490 r.p.m., the 10-hp. at 650 r.p.m. Wayne Pump Co., Fort Wayne 4, Ind.

•

Rubber Conveyor Belt

Top compound on rubber conveyor belt provides a rough surface, said to hold packages, bags, or containers on inclines up to 30 degrees. Duck and rubber plies form the carcass of the belt, which is available in 3- or 4-ply, up to 48 inches in width. Buffalo Weaving & Belting Co., 218 Chandler St., Buffalo, N. Y.

•

Electric Immersion Heater

Thermostatically controlled electric immersion heater which can be connected to hot water tank or boiler to provide electrically generated heat is fitted with a bushing with a 1-in. tapered pipe thread to fit standard boilers. A 1¼-in. thread may also be obtained on order. The unit has a pilot light, and a thermostat which maintains the heat at any desired temperature, is adjustable, and prevents danger from overheating. Vulcan Electric Co., Danvers, Mass.

•

Tool Holder

Device for suspending portable tools near the working area, but out of the way while not in use, has a working range of 6 feet. It is suitable for use with tools weighing up to 10 pounds and remains vertical under all operating conditions, according to manufacturer. Called the Bal-

SHEET SEWING ROOM at Dan River Mills. In this area of critical seeing tasks, Color Conditioning combines with good light to aid visibility, improve the quantity and quality of output, and reduce accidents.

SAFETY! Du Pont Safety Color Code "points up" hazardous areas . . . helps prevent injury. Colors and symbols quickly identify first aid and fire protection equipment.

MORALE! Pleasant surroundings give employees a "lift," pay off in better morale, better care of equipment. In cafeterias, restrooms, offices, etc., COLOR CONDITIONING imparts an agreeable, efficient atmosphere.

SERVICE! A Du Pont maintenance painting expert is ready to discuss COLOR CONDITIONING with you . . . show you how it can be applied to your buildings.

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works at Dan River Mills

DAN RIVER MILLS, Danville, Va., one of the world's largest textile mills, put color to work four years ago. Benefits were apparent in a short time. Employees said weave and spinning rooms "seemed cooler," that color lessened eyestrain on delicate work around machines, let them *see* what they were doing. Result: increased production, lower accident rate, better employee morale.

Color Conditioning can work for you . . . regardless of your business. You may make fine lace or heavy machinery, in an old or modern building. Whatever the case, it *pays* to help employees see better, feel better, work better . . . through Du Pont Color Conditioning.

And Color Conditioning costs no more than ordinary maintenance painting . . . *less* in the long run. Mail coupon for full information. No obligation, naturally.

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THROUGH CHEMISTRY

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You want more production . . . you want simpler, less costly procedures and you want a lower break-even point. Wait no longer. Get in touch with Remington Rand today. The folder shown at the left will give you preliminary facts.

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- Flat Drawer Files
- Tool Trays
- Desks
- Stools
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- Sorting Files
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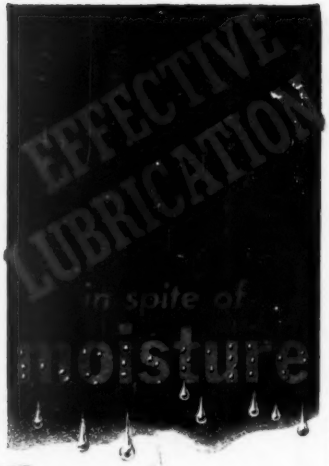


Operation of production machinery in the presence of moisture, steam and acids has always been a serious problem in many processing industries. There are a number of LUBRIPLATE lubricants that satisfactorily meet these unfavorable operating conditions, thereby protecting machine parts against rust and corrosion. Write for interesting particulars.

LUBRIPLATE

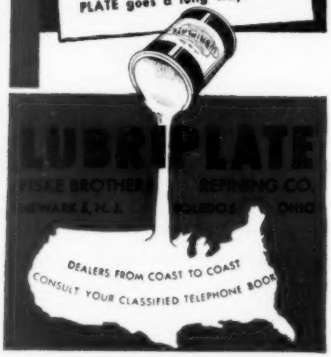
Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE

Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.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DEALERS FROM COAST TO COAST
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ancer, it is housed in an aluminum inclosure, weighs 5¾ pounds. Adjustments in positioning the tool are made by moving a clamp and rubber bumper up or down the wire rope. Keller Tool Co., Grand Haven, Mich.

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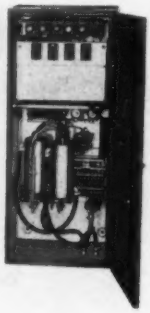

Electronic Spot Welder Control

Class 8992 electronic spot welder control unit includes NEMA Type 3B timers and ignitron tube contactors. The timer uses no sequencing relays and will operate at the peak speed of over 400 welds a minute. The six-tube circuit is said to cancel out operating delays of valve and firing relays and to hold time setting down to one cycle for fast mechanical operation. Regulated d.c. timing circuits permit line voltage variations as great as ± 10 per cent.

Firing relay operation is coordinated with a.c. line supply to provide a consistent starting point for each weld and to permit full cycles of welding current. The timer can be connected for either common or separate control supply of 115, 220, or 460 volts, 50 or 60 cycles. A separate contactor panel accommodates sizes A, B, or C ignitron tubes. Disconnect plugs permit removal of timer and power supply in one piece. Meter and oscilloscope readings can be taken without disassembling the control. Square D Co., 4041 North Richards St., Milwaukee 12, Wis.

•

Shut-Off Valve

Automatic low-pressure shut-off valve incorporating a precision-locked synthetic rubber seat for positive closure, is suitable for gas or fluid lines where closure is desired

FOR SAFETY PLUS

For *better* rubberized Work Gloves, look for the HOOD Trade Mark — a sign of quality since 1896. Styles to suit every requirement. Send for folder. Order from your jobber.

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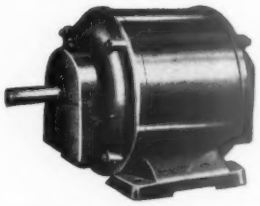
***This* MOTOR *is holding down thousands of* JOBS—**



Because VALLEY Ball Bearing Motors are designed and built in a wide variety of sizes and types, they are highly adaptable to fit any power requirement. Check these VALLEY advantages—

- **They take unusual power loads**
- **They are Drip proof . . . splash proof**
- **Economical**
- **Cool**
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Look to VALLEY for dependable power Units.

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Drop Forge Division Operations

WILLYS-OVERLAND MOTORS, INC.

Emphasize Speed of GAS

SPEED HEATING of small billets for drop forging demonstrates the speed of GAS for production-line operations requiring a flexible, controllable fuel.

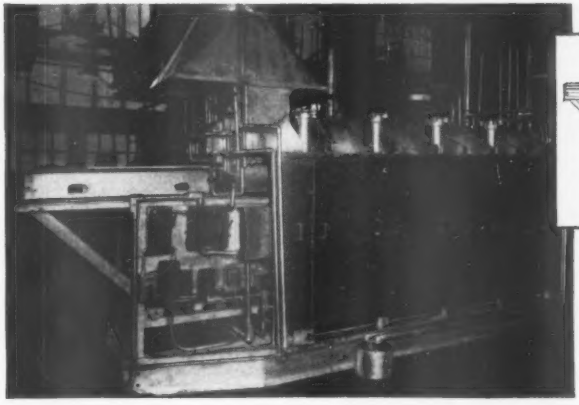
Drop Forge Division engineers and metallurgists, working with the furnace manufacturers, devised a simple Gas-fired, continuous-cycle billet furnace with the following characteristics and capabilities:

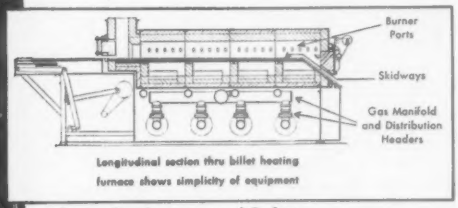
- **Billet Temperatures—2,200°-2,300°F**
- **Billet Heating Time—4 minutes normal (can be regulated as required in production schedules)**
- **Billet Discharge Rate—440 per hour, on 4-minute cycle**
- **Piece Dimensions (Average)—1"-2.5" thickness or diameter for rounds, squares, or flats up to 10" in length**
- **Furnace Heat-up Time—2,500°F in 15 minutes after initial lighting**

Quite as important as the productive capacity of the furnace are results of high-speed billet heating with GAS—

- **Uniform temperature of billets improves workability in forge**
- **Reduced scale minimizes abrasion in dies**
- **Flexibility for different sizes and shapes without costly equipment changes**
- **Economy of operation, of fuel costs, and of equipment investment**

This application of modern Gas Equipment in an important production-line process is just one of the contributions made by GAS to industrial progress. There are many other heat-processing operations such as annealing, normalizing, stress-relieving, case-hardening, in which the productive flames of GAS have established records for productioneering. They're worth investigating.





Longitudinal section thru billet heating furnace shows simplicity of equipment

Section Drawing courtesy of Surface Combustion Corporation, Toledo, Ohio, manufacturers of the billet heating furnace.

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE NEW YORK 17, N. Y.

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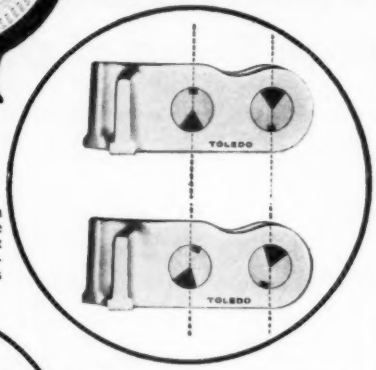
1 EXCLUSIVE

TOLEDO DIAL with Full Floating Double Pendulum Mechanism

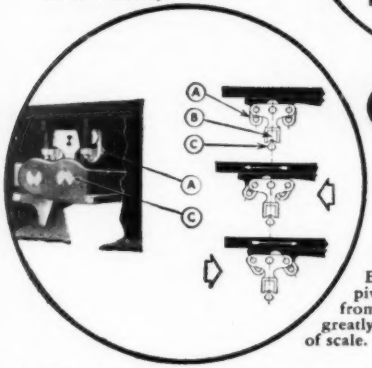
. . . maximum accuracy and dependability in automatic weight indication.



2 EXCLUSIVE

PIVOTS Interchangeable and Self Gauging

assure that original accuracy can be maintained throughout scale life. In illustration, note that knife edge position remains unchanged, even when pivot is shifted radically.



3 EXCLUSIVE

Double Parallel Link PLATFORM SUSPENSION

absorbs side impact, Guards Accuracy. Cut-away corner shows platform is supported by freely hung, parallel links. The suspension links (A) take up all horizontal movement. Bearing (B) resting on pivot (C) never moves from center line . . . adds greatly to long-life accuracy of scale.

Get the *closer cost control* you need today . . . with TOLEDO all the way! Whether it's weighing, counting, force-measuring, batching or testing . . . look to Toledo, Industry's No. 1 Scale for accuracy, speed and long-life dependability. Send for new bulletin No. 2020. Toledo Scale Company, Toledo 12, Ohio.

TOLEDO

HEADQUARTERS FOR SCALES

when pressure fails from any cause. Self-contained mechanism is not dependent on external actuating forces, is said to be accurate and dependable, and must be reset manually after closure. Valves are set to close at pressures specified by the customer, are available in models for high- and low-pressure use, in sizes ¾ through 8 inches. Security Valve Co., 410 San Fernando Road, Los Angeles.

•

Low-Voltage Rectifier

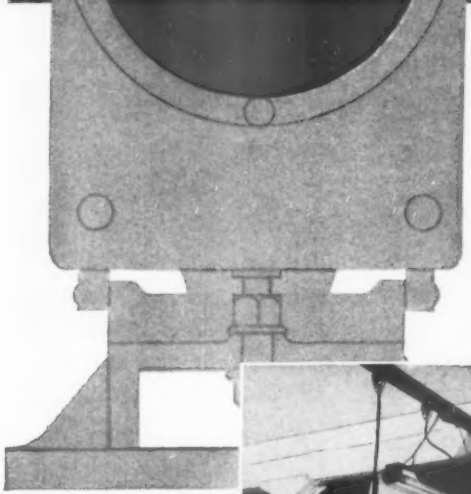
Low-voltage, high-amperage rectifier, Type N2400CX, is suitable for supplying direct current for such processes as electroplating and cleaning, electrolytic production of aluminum hydroxide for water purification processes, and production testing of d.c. motors and equipment. Its a.c. input is 440 volts, three-phase, 50/60 cycles. D.c. output voltage is continuously variable from 0 to 6; d.c. output amperes, 2400-amp. continuous rating. It is cooled by forced air from two three-phase, 1/6-hp. ball-bearing motors. Overload protection is provided by a fused safety switch, a magnetic contactor with thermal overload trip mechanism, air switch to guard against failure of fan motors or blocking of air passages, fuse protection for control devices and wiring, and thermostat to disconnect rectifier in the event of over-heating of rectifier stack. Manufacturer states that because the variable-voltage transformer is motor-driven, the output voltage can be adjusted from remote locations or made to respond to automatic controls, making it suitable for applications requiring constant regulated output or varying output which responds to an external signal. Unit is self-contained in one welded steel cabinet, 31x48x71 inches weighing 2100 pounds. Electronic Rectifier Co., Inc., Rochester 2, N. Y.

•

Dry-Chemical Fire Extinguisher

Hand-portable dry-chemical type fire extinguisher No. 30 Alfco, features long-range, long-duration, and complete discharge of contents, gas-tight construction with built-in safety disk, and ligh weight. The chemical is said to be non-toxic, non-corrosive, a non-conductor of electricity, and is said not to freeze. Unit is rated B-1 and C-1, and is suitable for flam-

You get 6 big advantages with New LTG Flex-a-Power...



The only unusually rugged plug-in or trolley busway in 2, 3 or 4 pole construction in one compact housing.

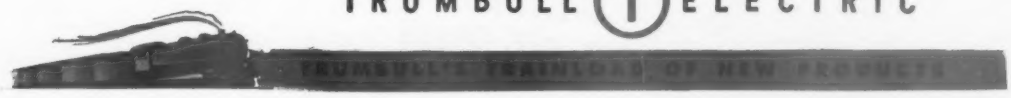
Pre-fabricated LTG FLEX-A-POWER — rated 50 amps — 250 v, AC or DC — supplies power for fluorescent lights and power tools. It provides both trolley power take-off and a continuous outlet — you can tap at any point . . . ideal for industrial plants, offices, stores, arenas, work shops and garages. Here are more new features:

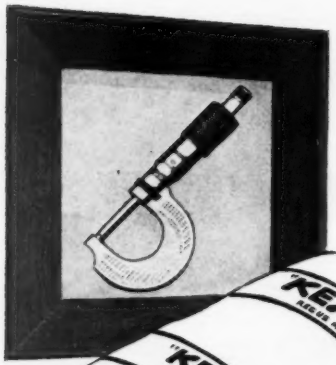
1. **EASY TO INSTALL** — simplified hanging and joining methods speed up installation.
2. **IT'S ECONOMICAL** — two or more circuits can be run in one housing — controlled separately.
3. **PERMITS BALANCED LOADS** — plugs or trolleys are polarized which provides a convenient means of balancing loads.
4. **IT'S REALLY RUGGED** — rigid construction of housing itself prevents sagging — only 2 hangers needed for each 10 ft. section.
5. **MORE FLEXIBILITY** — standard fittings such as elbows and radius sections permit economical custom installations — easy to disassemble and relocate.
6. **GREATER CONVENIENCE** — trolley with silver alloy contacts may be inserted or removed at any point along the run — no "drop-out" section required.

FOR MORE INFORMATION, write for circular TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC





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KEX INDUSTRIAL WIPING TOWELS

are made for a specific job...

and that job is Wiping!

This is why KEX INDUSTRIAL TOWELS are uniformly:

1. Soft... woven from thirsty cotton with no harsh surfaces to mar delicate machinery or finished products.
2. Bound at the edges, so that there are no loose or ragged ends to get caught in moving machinery.
3. Made a convenient, uniform size so that every square inch is usable.
4. Super-absorbent and scientifically cleansed to reduce possible infection.
5. *Actually precision items,* produced precisely for one purpose only—*your important wiping jobs.*

Rent KEX wiping towels and figure your profits!

There's nothing to buy, no expensive inventory—just a low monthly rental. KEX TOWELS are delivered in neat, easily stored bundles, regularly in quantities as desired. This helps you control distribution.

For complete information see your classified telephone directory for nearest KEX Distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

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mable liquid and electrical fires. American-LaFrance-Foamite Corp., Elmira, N. Y.

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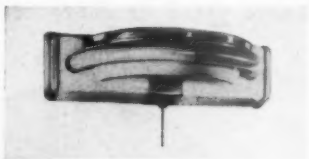

Side Wall Fluorescent Fixture

Curved fluorescent side wall fixture uses an 18-watt Westinghouse bulb, called Circlarc, said to be equivalent to about a 60-watt incandescent light. It is constructed with a baked white enamel finish, chrome center strip, has a pull chain switch, and an electric outlet for appliances. It measures $14\frac{1}{4}$x$14\frac{1}{8}$x$6\frac{7}{8}$ inches, and fits flush to the wall. Homecraft Electronic Products, 1201 South Kedzie Ave., Chicago 23.

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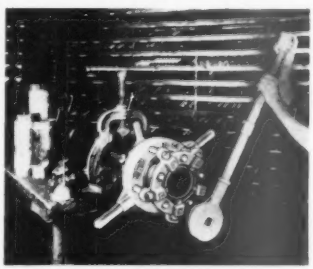

Pipe Threading Tool

Pipe threading tool, called The Leader No. 54, is built to withstand the strain when used with drive shaft for power operation with a portable pipe machine. For hand operation, the tool is used with a ratchet handle. Geared receding die-stock has a drive gear with tensile strength of 40,000 to 60,000 p.s.i. The steel pinion runs in a needle bearing and is supported by a tubular steel housing.

Pinion has machine cut teeth, with graduations on the pinion shaft housing to indicate correct length of thread to be cut, and is completely hooded. The tool is furnished with four sets of dies, each set having five individual and replaceable segments. Each set of dies threads one pipe size only. The four standard pipe sizes are $2\frac{1}{2}$-, 3-, $3\frac{1}{2}$-, and 4-in. Die holder is a separate and replaceable unit, adjustable to permit cutting oversize and undersize threads. The Oster Mfg. Co., 2057 East 61st St., Cleveland 3.

•

Low-Voltage Control System

For switching of lighting and appliance circuits, low-voltage control system features small, remote control relays which handle the load, and which can be installed in a knockout of the nearest outlet box. Individual relays are controlled by

Bunting

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Individually packed in cartons for easy handling.

FIRST . . . the teeth are set into the back of the saw, which means added strength . . . and practically no tooth rippage.

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NEW HAVEN 5, CONNECTICUT, U. S. A.

any number of conveniently located switches operating on a 24-volt system. Manufacturer states that one relay can be operated from any number of control switches located at various points, or several relays can be operated from one point by means of either manually or motor-operated master switches.

Light in an area to be entered may be turned on by remote control, and at the same time light turned off in the area left behind. Any number of control stations can be operated in parallel. Master systems permit control of selected light from a single point, or the switching on or off of either all or a certain group of lights from a master control station. Sudden floodlighting of an entire building or area may be used as protection against illegal entry. Square D Co., 6060 Rivard St., Detroit 11.

•

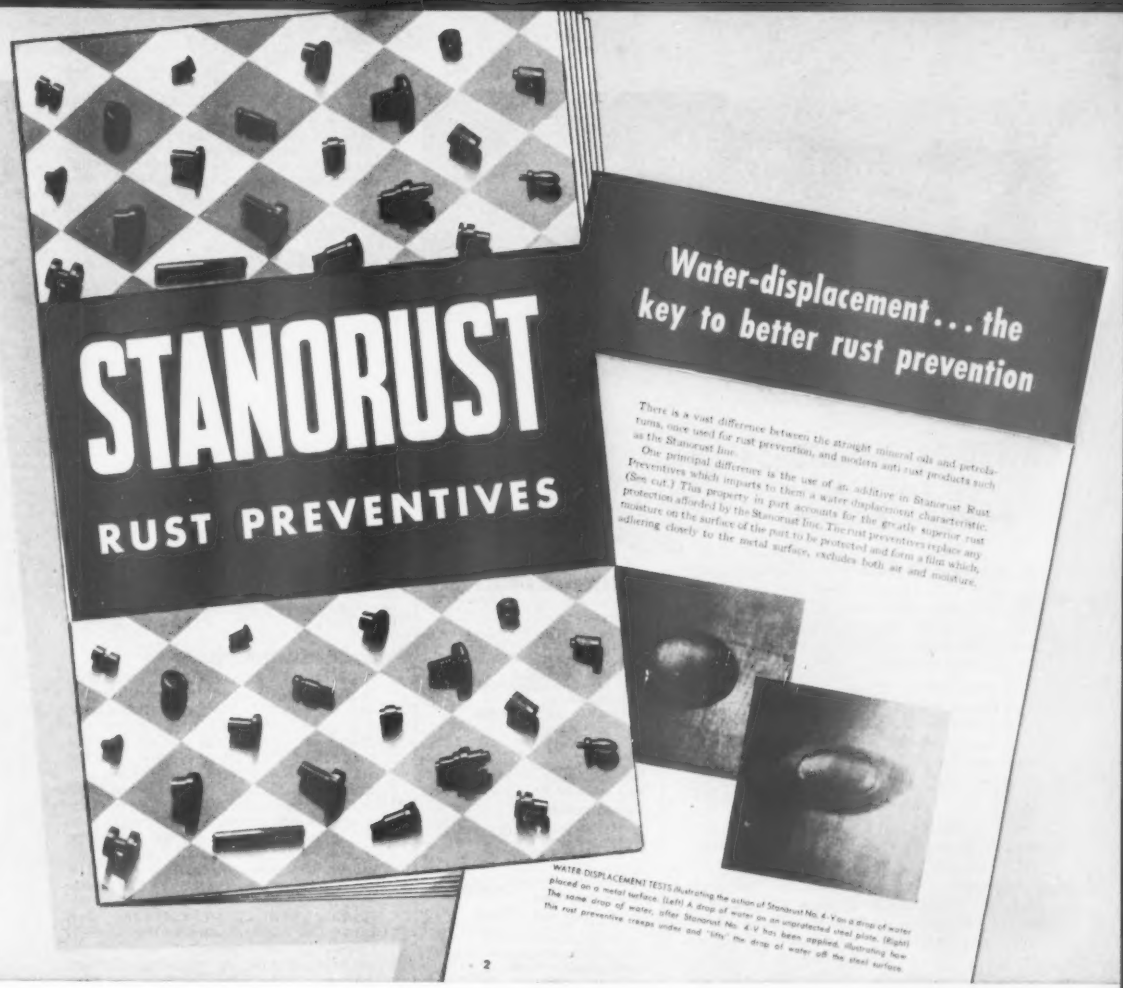
Floor Machine

For use on floors of all types, machine scrubs, steel-wools, dry-cleans, and polishes. It also shampoo-cleans rugs by a process called Foamaster, using an attachment that applies liquid soap foam without soaking the fabric, according to its maker. Features include automatic sealed-in-oil lubrication, rigidly centered assembly of shafts, gears, and ball bearings. Available in heavy-duty sizes, ranging from 14 to 22 inches in diameter, general-duty, from 12- to 15½-in. diameter, and the rug cleaning models, 14, 16, and 19 inches. Atlas Floor Surfacing Machinery Corp., 248 East 34th St., New York 16.

•

Rigid Coupling

Used for rigidly connecting the ends of two shafts, rigid coupling takes the place of manufacturer's flange couplings in sizes up to and including 2 15/16 inches, and will be furnished in sizes up to and including 5 inches. They will also replace manufacturer's ribbed and compression couplings. The old type flange


STANORUST
RUST PREVENTIVES
Water-displacement . . . the key to better rust prevention
There is a vast difference between the straight mineral oils and petrolatums, once used for rust prevention, and modern anti-rust products such as the Stanorust line.
One principal difference is the use of an additive in Stanorust Rust Preventives which imparts to them a water-displacement characteristic. (See cut.) This property in part accounts for the greatly superior rust protection afforded by the Stanorust line. The rust preventives replace any moisture on the surface of the part to be protected and form a film which, adhering closely to the metal surface, excludes both air and moisture.
WATER DISPLACEMENT TESTS illustrating the action of Stanorust No. 4. Von a drop of water placed on a metal surface. (Left) A drop of water on an unprotected steel plate. (Right) The same drop of water, after Stanorust No. 4 V has been applied, illustrating how this rust preventive creeps under and "lifts" the drop of water off the steel surface.
2

Here's the answer to your rust prevention problems

THE BOOKLET illustrated above holds the means to more complete and more economical rust control in your plant. It will help you analyze your rust prevention problems and needs. It tells how the new, improved Stanorusts now fully meet these needs.

The eight grades of Stanorust are described. They range from a fingerprint remover to a heavy, petrolatum-type product that protects against corrosion under the most severe outdoor exposure for years.

Find out why Stanorusts can mean big savings for you through better rust protection. Send for this booklet. Write for your copy today. Simply address your letter to Standard Oil Company (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

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STANDARD OIL COMPANY (INDIANA) STANDARD

LABORATORY OR PRODUCTION LINE...

Kathabar Systems

CONTROL HUMIDITY
TO JUST THE DESIRED AMOUNT

● In the new and modern development building of a large petroleum products marketer there was recently installed Kathabar Package Units to provide year-round humidity conditioning for each individual laboratory. These applications included the following:

● Rubber, plastic, latex lab.	76°F and 50% RH
● Physical lab.	74°F and 40% RH
● Process Research lab.	74°F and 40% RH
● Gas Analytical lab.	74°F and 40% RH
● Lube Group lab.	77°F and 50% RH
● Paint lab.	74°F and 40% RH
● Motor lab.	75°F and 40% RH

These Kathabar units can produce atmospheres ranging from below 10% to 50% relative humidity at 80°F, as the need may be.

Laboratory operations are exacting and that is why Kathabar Systems are installed where humidity is an important factor. Laboratory operations are comparatively small as compared with production lines but Kathabar units are reliable, dependable and accurate from the smallest package unit to a large central system.

Kathabar Humidity Conditioning has been proved in industry. Today there are over 300 installations in operation in the country's leading industrial plants and commercial establishments. Many of these installations are repeat orders. Why? *Because Kathabar Systems control humidity . . . produce the desired results.*

GET THE FACTS ● Ask a Kathabar Humidity Engineer to present proof of Kathabar dependability.

A PARTIAL LIST OF KATHABAR APPLICATIONS

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Sensitized Paper Mfgr.
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Gelatin Capsule Processing
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Chemical Processing
Processing of Sodium
Vitamin Mfgr.
Gunpowder Processing
Processing Plastics
Rocket Powder Processing

MANUFACTURING
General • Ceramics Drying
Storage of Highly Finished Metal Parts (Corrosion Preventing)
Compressed Air Drying
Covered Cable Drying

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Powdered Metals Processing
Cupola Dry Blast (Foundry)
Safety Glass Manufacturing
Magnesium Castings Production
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Candy Making • Fish Drying
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Processing Powdered Coffee
Cranberry Dehydration
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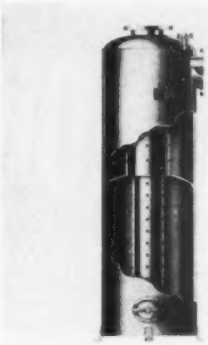
coupling will be continued in sizes from 3 7/16 up to 12 inches. Manufacturer states that the new coupling permits easy coupling or disengagement of shafts, and claims that the equivalent of a shrunk-on fit is obtained simply by fastening two setscrews. Dodge Mfg. Corp., Mishawaka, Ind.

●



Exhaust Snubbers

Line of side inlet exhaust snubbers, featuring a "Fog-jet," is suitable for use on 2- and 4-stroke cycle stationary gas engines, operating either the diesel or Otto cycle, which require control of exhaust explosions during starting. Designated as Series SDL, units are available in pipe sizes from 5 to 30 inches. Device incorporates a jet which sprays a water mist into the exhaust gases. Flame from the engine is extinguished by the device, states the manufacturer, while the gas in the snubber is said to be made non-flammable by the mist. A deflecting plate built into the unit serves to spin off any exhaust slugs entering the snubber, and, it is claimed, breaks up carbon and other foreign material. Burgess-Manning Co., Libertyville, Ill.

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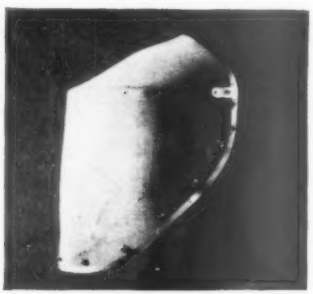


Safety Heat Mask

To provide protection, comfort, and free vision for workers around blast furnaces, cupolas, heating furnaces, soaking pits, and other intensive heat areas, heat mask is made of 30-mesh steel screen which deflects heat away from the wearer and prevents infra-red burn. For added protection, an optional bib and/or snood made of virgin wool are available. These

Simple as pinching a rubber tube

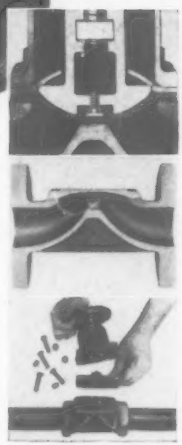
A GRINNELL-SAUNDERS DIAPHRAGM VALVE works on a simple principle . . . it pinches tight for positive closure and opens wide for streamlined flow. The working parts of the valve are completely isolated from the fluid . . . no corrosion, no contamination and no leaks. Choice of diaphragm material. Body materials . . . cast iron, malleable iron, bronze, aluminum, stainless steel. Body linings . . . glass, lead, rubber or synthetics.

NO METAL-TO-METAL SEAT . . . The large contact area on which this flexible diaphragm seats gives positive closure even when grit, scale or other solid matter is temporarily trapped.

MINIMUM RESISTANCE TO FLOW . . . Smooth streamlined fluid passage without pockets prevents accumulation of sludge and reduces friction resistance to a minimum.

MAINTENANCE REDUCED . . . The diaphragm is the only part that normally wears out. Replaced in a few minutes without removing valve from line.

Available in various combinations of valve bodies and operating mechanisms.



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may be attached by snap-fasteners to the headpiece, to cover the upper chest, head, and back of the neck. Mask weighs 18 ounces and is fitted with a fibre chin rest and adjustable head gear. Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8.

•

Switchgear Differential Relay

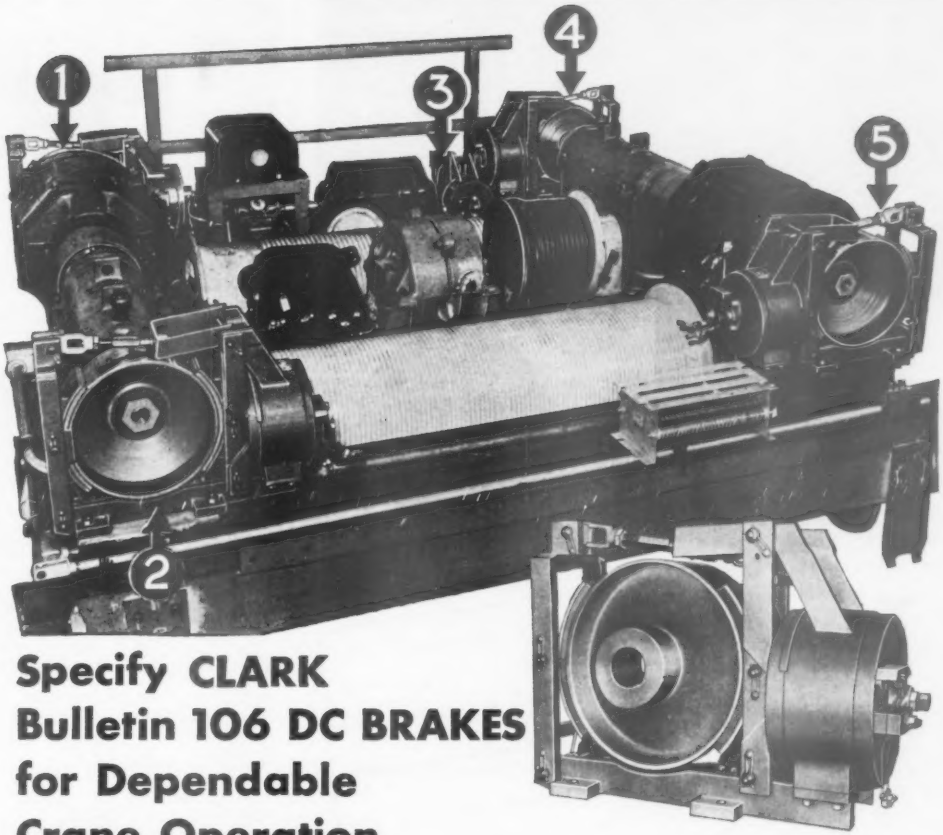
Made up of high-speed plunger-type adjustable units, switchgear differential relay operates from the voltage generated in the secondaries of standard bushing current transformers, instead of from the current flowing in these secondaries. Published data on the characteristics of standard current transformers may be used for its correct application, states the manufacturer, without requiring the calculation of the saturation phenomena of current transformers. The relay is a high-speed device, sensitive to internal (bus) faults but insensitive to external (feeder) faults. As a result, it is said that any usual number of circuits can be accommodated with the new scheme and additional circuits can be easily added. Switchgear Divisions, General Electric Co., Schenectady 5, N. Y.

•

Thermometers

Heavy-duty, dial type thermometer has pointer indications which may be read from almost any position, according to manufacturer, because the concave dials are curved at the indicating graduations. Available in seven temperature ranges, from —90 to +1,000 deg. F. Dial sizes are 2, 3, and 5 inches. The connecting nut and stainless steel stem of the ther-

Crane Trolley uses 5 CLARK *SHOE BRAKES*



Specify CLARK Bulletin 106 DC BRAKES for Dependable Crane Operation

There are five CLARK BULLETIN 106 DC Brakes on this Crane Trolley. Note on the inset picture of the Brake the sturdy all-welded construction which provides a high strength safety factor in heavy duty operation. After installation, there is only one maintenance adjustment—and that's for lining wear. That one adjustment is on TOP, not on the bottom, not on the sides, not on the ends, but on top where perfect visibility makes adjustment simple and easy.

Write for CLARK Bulletin 106

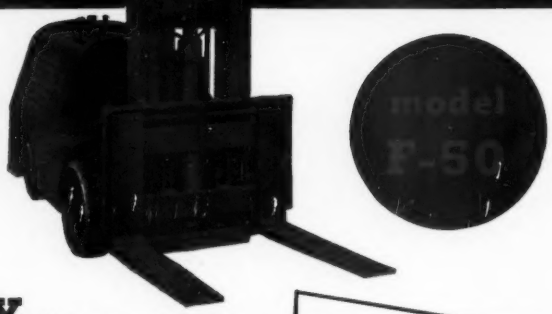
EVERYTHING UNDER CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

DON'T BUY ANY LIFT TRUCK until you see the revolutionary

New BUDA



You'll get a new conception of fork lift truck service when you see the new Buda F-50. It's up to 37% faster than other units, *both forward and reverse* . . . has more "free lift" for stacking in box cars, trucks and low ceiling areas. Also offers better driver vision, plus new engine, clutch and parts service features that will save you substantial sums annually in lift truck maintenance.

- 5000 lbs. capacity at 20"
- 55" free lift . . . overall ht. 83"
- 3 speeds forward and 3 speeds reverse to 11 MPH
- Rugged industrial-type engine with replaceable cylinder sleeves
- Unobstructed driver vision
- New "quick-change" clutch — easily replaced in ½ hr.
- Also 1000 lb. and 2000 lb. Buda models for lighter lifts

BH-6

THE BUDA COMPANY
Materials Handling Div., Harvey, Ill.

Rush details on Buda Lift Trucks ☐ 5000 lb. ☐ 2000 lb. ☐ 1000 lb.

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momometers are said to withstand pressures in excess of 2500 p.s.i. Cases are hermetically sealed and manufacturer states that the pointers show no oscillation under extreme vibration conditions. Qualitrol Corp., East Rochester, N. Y.

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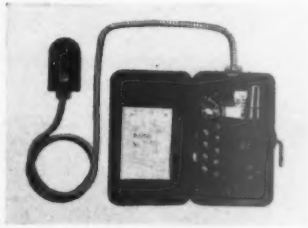

General-Purpose Photoelectric Control

Designed to provide automatic control for specialized processes, and for counting, conveyor control, short-range signal systems, motor or valve control, production inspection, machinery safeguard, and stop-motion control, photoelectric control, Type 20DJ1, is also suitable for safety alarms and door operator service. Adaptable for use where space is limited, the phototube, which must be located where the operations are to be controlled, is available either integral with the housing or in a small separate housing.

A tamper-proof sensitivity adjustment on the control permits positive operation under varying distances between phototube and light source and under all conditions of ambient light, according to the manufacturer. It is intended for high-speed operation. Relay operates in one-twentieth of a second. Designed for 115- or 230-volt supply, operating range is 10 feet. Sensitivity adjustment provides for relay operation at a predetermined level of illumination within the range of 10 to 50 foot-candles. Photoswitch, Inc., 77 Broadway, Cambridge, Mass.

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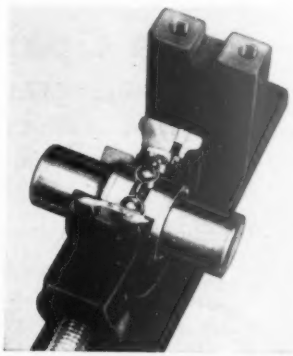
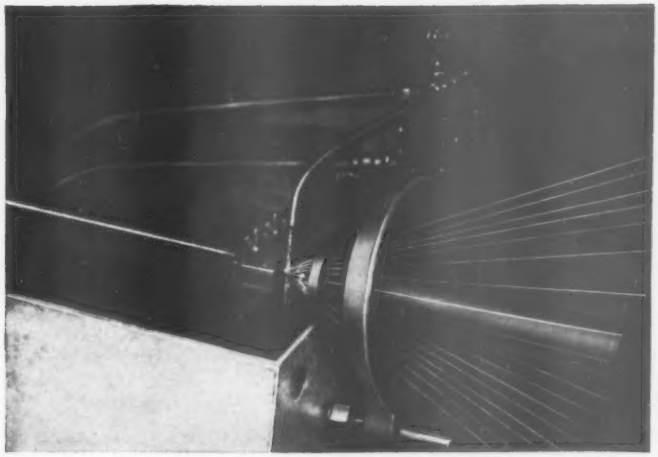


Conveyor Take-Up Unit

Series of take-up units, suitable for conveyor application, shaft adjustment, and belt tightening devices, is designated Type LTU. In shaft sizes ranging from ¾ to 2 7/16 inches, they incorporate pre-lubricated, self-aligning wide inner ring ball bear-



Hot Oil Treatment for Steel Muscles

THIS 82-PAGE BOOK ON WIRE ROPE IS FREE. WRITE FOR YOUR COPY TODAY!

Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write—Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

Field lubrication of wire rope does much to prevent friction and corrosion and should not be neglected. However, it is only a *surface* treatment. To provide proper *internal* lubrication, every strand of Wickwire Rope is actually formed in a stream of hot, quick-setting lubricant which packs the many spaces between the wires of the strand.

Fiber cores, too, are saturated with a compound that lubricates the strands after the rope has been put in service. This built-in protection is the result of years of study to develop a lubrication system that would afford protection against factors which bind ropes and result in loss of strength and rope life.

Thorough lubrication is only one step in the quality control of Wickwire Rope manufacture—but we at Wickwire believe that *every* step is important to assure finished rope that will provide the utmost in performance, safety and long life.

Wickwire Distributors and Rope Engineers are always ready to help solve your wire rope problems and supply the right rope for your needs. Wickwire Rope is available in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed.

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PACIFIC COAST SUBSIDIARY—The California Wire Cloth Corporation, Oakland 6, California

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raises profits for M & R

With the reach of a giant, the Crescent Electric PALLETIER finds extra storage space way up at the ceiling in the M & R Dietetic Laboratories, Columbus, Ohio. It lifts. It hauls. It tiers. It does the whole handling job with just one operator. The PALLETIER picks up profits by lowering handling costs.

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Crescent Truck Company
1100 Willow St., Lebanon, Pa.

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ings with self-locking collars. An inner steel plate shield attached to the bearing's outer ring retains lubricant, while a rotary slinger attached to its inner ring surface throws off contaminants. The Fafnir Bearing Co., New Britain, Conn.

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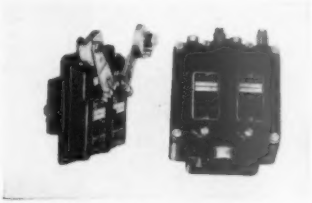


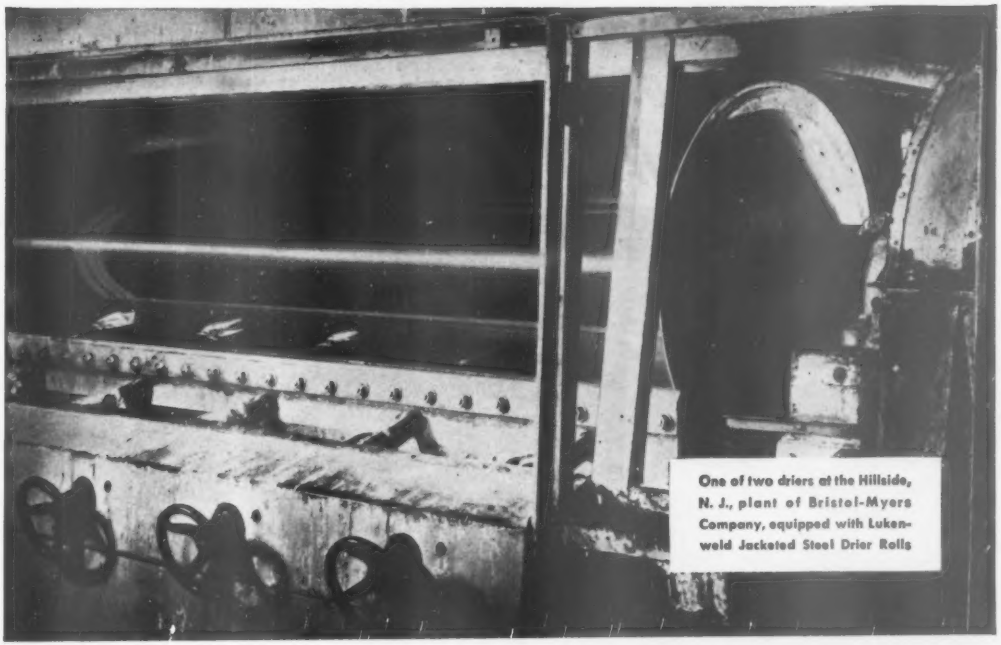
Duplex Limit Switches

For use on machine tools to limit travel in either of two directions, duplex limit switches can also be used to provide two different travel speeds. Manufacturer states that by using two oiltight switches in a single assembly, only one run of conduit is required for necessary control wires. Both surface mounting and flush mounting types are available. Each switch has a single pole, double throw snap action mechanism and two electrical circuits, one of which is normally open, the other normally closed. The snap switch cases are of melamine, a non-carbon-tracking plastic. Switches are available with either two pushrods, two plain roller arms, or two one-way rollers. Return springs can be changed for the reverse direction of operation, states the maker, who adds that on roller arm types, removal of the spring provides maintained contact operation. Switches are rated at 600 volts a.c. or d.c. and will operate in temperatures up to 200 degrees F. Square D Co., 4041 North Richards St., Milwaukee 12.

•

Unit Heaters for Steam, Hot Water

Line of unit heaters for steam or hot water features a heating coil constructed of one-row Aerofin coils of continuous U-bend copper tubing brazed into steel headers. Deep and wide fin spacing is said to minimize resistance to air flow, provide good heat transfer, facilitate cleaning, and reduce operational noise. Simple design and lightweight make the suspended unit easy to install and



One of two driers at the Hillside, N. J., plant of Bristol-Myers Company, equipped with Lukenweld Jacketed Steel Drier Rolls

Bristol-Myers *Upped Production 41%* with Lukenweld Jacketed Drier Rolls

PATENTS APPLIED FOR

200 pounds of dried, flaked material every 7 to 8 minutes instead of the 10 to 11 minutes formerly required! That's how much Bristol-Myers stepped up output from these machines simply by replacing drum-type rolls of different material with Lukenweld Jacketed Steel Drier Rolls—an average increase of 41%.

No other changes were made. The increased production was entirely due to the increased drying rate and positive method of condensate removal of rolls of Lukenweld design and steel plate construction. Had steam pressure been increased above the 80 psi used in both old and new rolls, the drying rate could have been further increased.

Records since installation of the Lukenweld Rolls in 1938 show a further saving. Despite the action of a 30% saline solution, the steel plate roll faces, which are chromium-plated, have lasted over six years. In contrast, chromium-plated surfaces on the old style rolls had to be refinished every year and a half.

If you have a job calling for roll drying, you can probably do it better and faster with Lukenweld Jacketed Steel Drier Rolls. Bulletin 358 tells you about them. Lukenweld, Division of Lukens Steel Company, 421 Lukens Building, Coatesville, Pa.

We'll lend you "LUKENWELD", a 16mm motion picture with sound, highlighting our methods, facilities and products. Running time: 20 minutes. Write for booking date.

LUKENS
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LUKENWELD
DRIER ROLLS AND DRYING MACHINERY

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

A CONVEYOR SYSTEM engineered by Alvey-Ferguson is virtually an endless-stream *indoor* transportation system that can take raw materials in one end of your plant and turn them out as finished products—shuttling them to storage banks or to and through the shipping rooms—even stacking them in box cars if you wish.

The A-F Chain Conveyor, shown above, handles heavy cast alloy boxes of stampings from the annealing furnace. It is only a small section of the *complete* A-F Conveyor System in a midwestern plant which enables operators to handle greater production with less effort—less fatigue—more efficiency.

Safety experts will be interested in the checkered plate walkway on either side of the live roller conveyor in which metal strips were welded to stabilize the footing of operators who have to cross it.

Greater efficiency in production is vital now as well as in the future. Write today for more information or a frank discussion of your production problems.

THE ALVEY-FERGUSON COMPANY

133 Disney Street *Established 1901* Cincinnati 9, Ohio

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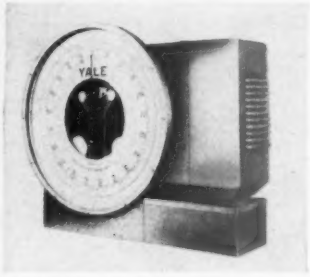
Alvey-Ferguson
METAL PRODUCTS CLEANING EQUIPMENT

service, according to the manufacturer, who states that the whole unit can be disassembled by the removal of four bolts and four screws. Carrier Corp., 300 South Geddes St., Syracuse, N. Y.

•



Weight Printer

Incorporated as an integral part of manufacturer's industrial scale, weight printer eliminates inaccuracies by printing actual weight in numerals 9/32-in. high, without additional printing or mental calculation. The various weights in a series can be identified by printing opposite the recorded weight from one to eight symbols, numerals or letters, making available accurate data for inventory control, shipping records, production records, or wage incentives. Other features include hinged selector fingers, which prevent damage to the selector fingers or printing disk mechanism should the printer be operated while a load is being moved on the scale; printing beyond the full capacity of the dial in the event of careless or accidental operation of the printer with the pointer beyond the last graduation. Printer is actuated by a depressing bar directly beneath the ticket slot, and operates on 110-volt, 60-cycle, single-phase a.c. Can be furnished for other currents on request. Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia.

•

Portable Compressor

Portable air compressor, called NCD, designed for use with a spray gun, weighs 32 pounds, and can be operated from any light socket or wall plug. Unit is said to hold a large capacity spray gun at 35 pounds pressure, and deliver 2½ cubic feet of air per minute. Also suitable for blowing dust or dirt from equipment, spraying insecticides or dis-

BWH
DEPENDABLE RUGGEDNESS
BOSTON WOVEN HOSE & RUBBER CO.
CONCORD
STEAM #10
BOSTON, MASS
BWH
MADE IN U.S.A.
1. Tough, long-wearing, abrasion-resistant cover.
2. Asbestos braid insures maximum cover adhesion, and includes NEW type static conducting wire.
3. High-tensile steel wire for strength, for safety.
4. Heat & oil resistant tube.

NEW! SUPER-FLEXIBLE! SAFE!

AMAZING BWH WIRE BRAID STEAM HOSE

Here's the armored steam hose you've been looking for! It's dependably rugged, and it satisfies the most rigid safety requirements. That's because BWH technologists have spared neither time nor effort in making Concord #10 Steam Hose the best hose of its kind we've ever produced. Here are 6 reasons why this hose will serve you better:

1. The heart of the hose is the same dependably strong rubber tube that has won fame for extra service in BWH BULL DOG Steam Hose.
2. It's muscled with braids of high-tensile steel wire, resistant to heat and high pressure.
3. An open braid of asbestos next to outer wire braid assures perfect cover adhesion.
4. An entirely new method of static control is the crossed wire braiding in the asbestos section — every length tested.
5. The cover is extra tough to resist abrasion, specially designed to resist high temperatures.
6. Because no cotton duck is used, Concord #10 gives longer service on constant pressure steams.

This new hose is extra flexible, too. In fact, Concord #10 is the most modern hose you're likely to find for refineries, core drilling and other high pressure jobs.

From a safety standpoint, Concord #10 rates tops. "Flash" explosions can't happen, because little whispers of steam seep out indicating replacement is necessary. There can't be any sudden bursts to cause injuries to workmen or result in expensive shut-downs.

When you need steam hose that's lightweight, flexible, rugged and SAFE, think of BWH Concord #10. It's your best bet . . . the safest we've ever made!

☆ ☆ ☆

HAVE YOU A JOB WHERE STAMINA COUNTS? Bring us your toughest problems. We're specialists in solving them. For all industrial rubber needs, look to BWH products for dependable ruggedness, to BWH distributors for dependable service.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS., U.S.A. P.O. BOX 1071, BOSTON 3, MASS., U.S.A.

9 out of 10 companies can save on shipping with ACME STEELSTRAP

ACME STEEL CO. CHICAGO

HERE'S HOW EBCO DID IT. Ebco Manufacturing Company, Columbus, Ohio, package their water coolers using Acme Steelstrap and Acme Equipment. They report a saving of 33% in materials and time over previous packaging method.

In addition, using Acme Unit-Load Band for freight car shipments, this company has obtained savings of 25% in dunnage materials, 50% in loading time and labor, and 90% in reduction of breakage and damage claims.

Find out how an Acme Shipping Specialist can help you. Call him (no obligation, of course) — or mail the coupon today for free booklet of case studies, "Savings in Shipping."

Close-up of the Acme No. 3 Steelstrapper *showing application of Acme Steelstrap which saved 33% in packaging cost.*

STRAPPING DIVISION

ACME STEEL COMPANY

NEW YORK 17 ATLANTA CHICAGO 8 LOS ANGELES 11

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Please send me a copy of your case history booklet, *"Savings in Shipping."*

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COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

infectants. Available either as a separate air compressing unit, or combined with several spraying outfits. De Vilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

•

Line Lift Trucks

Line of lift trucks, called Lift-King, includes both electric and gasoline-powered units. They feature a single piston 2-stage hydraulic lift mechanism. Pushers, rotating devices, clamping devices, and automatic fork adjusters may now be used as standard accessories, according to the manufacturer. Design of one model permits 66-in. load lift before telescopic mechanism begins to rise, making it possible to tier material inside freight cars and other low headroom spaces. It reaches 130 inches from floor, has over-all collapsed height of 83 inches, can carry up to 6,000 pounds. Another model has collapsed height of 68 inches, a free lift of 51, and a total reach of 100 inches. Both models can tilt 5 degrees forward or 10 backward, and both may be obtained with either gasoline or electric power. The gas-powered model is equipped with standard Chrysler fluid drive. Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia 15.

•

Portable Electric Drill

Known as Zephyr Model 1950, portable ¼-in. electric drill incorporates a fan-cooled universal 115-volt motor. Drills wound for other voltages are available. The housing, handle, and gear case are die-cast aluminum, and a Cutler-Hammer trigger switch is built into the handle. No-load speed is 1600 r.p.m., full-load speed, 900 r.p.m. Capacity in steel is ¼ inch, in hardwood, ⅝

Pittsburgh CARGOTAINERS

helped save 2067.70 man hours per month at INGERSOLL STEEL

OLD WAY:
Handling small parts in all sorts of containers posed real warehousing problem—wasted storage space.

NEW WAY:
In collapsible Cargotainers, small parts now move easily from receiving through shipping. 50% reduction in handling costs—85% increase in storage capacity.

You may feel that small materials handling is an unimportant part of business—yet here's how Ingersoll Steel Company saved 2067.70 man hours a month* after installing pallets and Pittsburgh collapsible Cargotainers:

Formerly, small parts were received from vendors in odd size barrels, kegs, cartons, boxes, burlap bags and loose. This resulted in excessive labor costs in receiving, warehousing and stock assembly lines and additional handling of parts which caused high scrap and damage loss. Lack of standardization of containers prevented proper inventory control and warehousing.

Nine months ago Ingersoll Steel standardized on pallets and Pittsburgh collapsible Cargotainers. These wire-mesh baskets were supplied to their vendors and the receiving, storing and shipping departments. Parts were uniformly stacked and better protected—excessive handling was eliminated—there was complete inventory control—a reduction in scrap loss—full utilization of storage space. This all added up to better housekeeping—safer and more efficient handling operations for both Ingersoll Steel and its vendors.

It will pay you to investigate Pittsburgh Pallets and Cargotainers. For your copy of our catalog write to Department F, Pittsburgh Steel Products Company, Grant Building, Pittsburgh 30, Pennsylvania.

** From "Wire Containers For Small Parts", Modern Materials Handling, December, 1948.*

CARGOTAINERS
by
Pittsburgh Steel Products Company

A Subsidiary of Pittsburgh Steel Company

Whether you run a huge plant, or a small job shop...

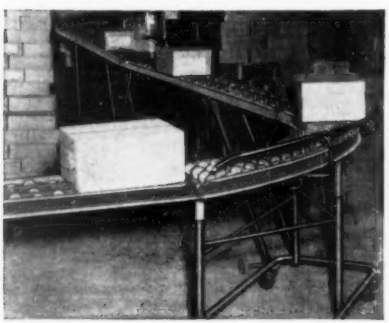
don't pay taxes to... n. h.*

***NEEDLESS HANDLING,** in any part of your plant operation, puts a heavy tax on profits. Loading or unloading, movement of work-in-process, filling mixed-package orders, or stacking for storage, may be costing you from two to twenty times more than is necessary!

Rapistan

MATERIAL *flow* EQUIPMENT

will cut operating costs, quickly pay for itself, and keep on making profits for you . . . indefinitely



Often the cost of Rapistan Material Flow equipment can be written off in a matter of weeks. Rapistan is the most flexible line of package-type conveyors in the country. You can get a simple, short length portable conveyor for truck loading, a between-floors power-belt, or a combination of multi-directional gravity and power flow. Rapistan equipment is easy to install, can be delivered promptly. With it you get all the benefits of leadership in experience and quality.

free help! *To help you visualize how you can profit by Rapistan Material Flow, write on your business letterhead for a copy of* "Rapistan Material Flow at Work." *No obligation.*

See how plant carloading was cut from 90 to 8 man hours...how storage confusion was eliminated and loading time reduced 66%...how a processor saved $200 a week . . . how 2 men do the work of 10 with less fatigue . . . and how Rapistan can work for you. Just write to—

THE RAPIDS-STANDARD COMPANY, INC.
12 Rapistan Building, Grand Rapids 2, Mich.
Representatives in All Principal Cities

CONVEYORS: POWER OR GRAVITY · PORTABLE OR STATIONARY

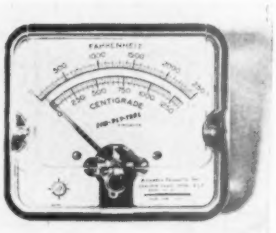
inch. Over-all length of drill is 8⅛ inches; weight, 3½ pounds. Portable Electric Tools, Inc., 255-259 W. 79th St., Chicago 20.

•

Plate Clamp

Designed for use in handling or processing plate glass, plate mirror, plastic sheets, stainless steel sheets, or any smooth surface materials, Nesco Plate Clamp has jaws of rubber to provide a non-slip grip and to prevent marring or scratching material. Clamp sizes are available for handling plates up to 2½ inches in thickness and loads up to 2,000 pounds. National Equipment & Supply Co., 295 Orange St., Newark, N. J.

•



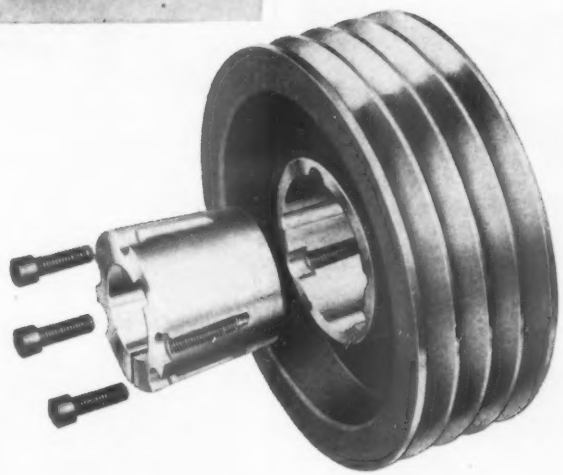
Pyrometer Indicators

Pyrometer indicators, available in several ranges for temperatures up to 2500 degrees F., and 1370 degrees C., are housed in a case 3¾x3⅝ inches, with a one-piece clear plastic front. Scales are over 3 inches long. Four ohms per millivolt gives a resistance of 212 ohms for 2500 deg. F. Thermocouples do not need calibrated leads, according to the manufacturer.

Meters are calibrated for 10 ohms external resistance, 8 ohms for 500 degree range. A resistance spool, connected in the thermocouple circuit, is brought out to an extra terminal on the back of the meter, using thermocouples with uncalibrated leads up

The simplest, surest mechanism ever devised for holding wheels to shafts

Holds fast to the shaft with firmness equivalent to a shrunk-on fit



No flange — no collar. Easy on, easy off. Slip it on and tighten while sighting

Stocked in complete range of sizes in Dual Duty (A and B); B, C and D grooves

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TAPER-LOCK

Trade Mark

V-BELT SHEAVE

This is one of the century's biggest developments in power transmission equipment—another Dodge "first." Simpler, tighter-fitting, truer-running, infinitely easier to handle. Saves installation time and results in neater applications—in the plant or on your product.

Dodge's sole business is to "get the power through"—smoothly, steadily, economically. To succeed in this business Dodge has developed *many* products that are outstanding in the field of mechanical power transmission. Your Transmissioneer, the local Dodge Distributor, is equipped to give you valuable information on new and better ways to transmit power.

DODGE MANUFACTURING CORPORATION, MISHAWAKA, IND.

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Dodge-Timken Bearing. 4 basic types in a vast range of sizes.

Taper-Lock Flexible Coupling. Ready to install without reboring.

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"SC" Ball Bearing with new Neoprene metallic-backed seals.

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FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

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FOR QUALITY:

Guaranteed to equal or exceed Federal Specifications. Produced, inspected and tested by one of the largest and best-equipped manufacturers in the business—makers of dependable lamps for industrial service for fifty years.

FOR ECONOMY:

Minimum lamp and lighting cost is assured when you buy CHAMPIONS, as a result of low overhead and direct sale through qualified electrical and industrial distributors.

GET NEW LIGHT ON PLANNED LIGHTING
THIRD INTERNATIONAL LIGHTING EXPOSITION and CONFERENCE
CHICAGO
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BOOTH NO. 136

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

to 15 feet long. When longer leads, up to 100 feet, are required, this resistance is left out of the circuit. The moving elements ride on polished pivots in sapphire jewels and have phosphor bronze hairsprings. Manufacturer states that instruments may be used in any position, and are fully compensated for ambient temperature. Assembly Products, Inc., Main & Bell Sts., Chagrin Falls, Ohio.

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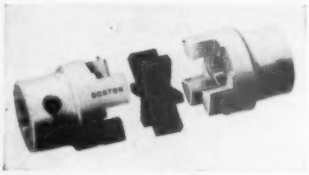

Flexible Coupling

Three-piece flexible coupling has an oil-resistant synthetic rubber insert said to provide quiet, flexible operation. Available for shafts of ⅜- to 1½-in. diameter, the coupling is provided with standard keyways and setscrew, requires no lubrication, and is impervious to oil, dust, or dirt. Boston Gear Works, Quincy 71, Mass.

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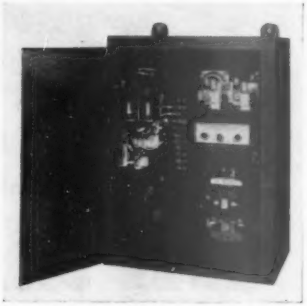


Small Welder Control

For use with small welders, packaged control unit is housed in a 17x14⅜x8-in. cabinet, completely wired, ready to install, according to its maker. It uses a NEMA 1A timer, and a high-speed magnetic contactor. A hinged door on the cabinet and a hinged control panel provide access to all component parts and wiring. The contactor is available in 100- or 150-amp. size. Single-stage timer may be adjusted from 3 to 120 cycles. Timer power supply operates from 115, 230, or 460 volts a.c.; units for other voltage or 25-cycle operation also available. Weltronic Co., 19452 W. Eight Mile Road, Detroit.

•

Evaporative Condensers

Line of evaporative condensers, in a range of from 3 to 50 tons (duplexed to 100 tons), features frame members so designed as to make possible multiple service and access panels in the welded frame assembly. Surface coils are made with copper tubes hydraulically expanded at 3000 p.s.i. into copper tube sheets with ferrule-collars. Manufacturer claims that vibration failures at tube

POP'S school of Filing

IT LOOKS LIKE JUGHEAD'S STAGE CAREER IS OVER! IF HE TURNS 'ROUND HE'LL KETCH A FILE IN HIS JUGGLER VEIN!
IF I C'N KETCH JUST ONE FILE I'LL BE SU'PRISED-- BECAUSE I WORK BETTER IN A SPOT-LIGHT!
JUGHEAD!! DROP THOSE NICHOLSON FILES! -ER- I MEAN HOLD ON TO 'EM-- OR YOU'RE GONNA BE IN A SPOT YOU WON'T LIKE!

"NO EXCUSE for file abuse," says Pop the foreman. On mass-production especially, the proper use and care of files enter heavily into savings in *man-hours*, *materials* and *new-file costs*. Here are some timely suggestions worth posting in tool-rooms, on shop bulletin boards, and over workbenches:

- Don't throw files among other tools or objects.
- Don't lay files on top of, or stack them against, one another. Keep them separate—either standing with tangs in holes, or hung on racks by their handles.
- Keep files in a dry place, so rust will not corrode their cutting edges.
- Keep files clean of filings. Tap file frequently on wood (not on metal) to loosen chips. Also brush with file brush or "card."
- Don't put too much pressure on the forward, or cutting, stroke.
- Never "drag" file back under needless pressure.
- Use *The right file for the job.*

The better the file the greater the reward of care. Nicholson and Black Diamond brands—*sold through industrial distributors*—are of the highest quality . . . made to serve long under normal circumstances, still longer under proper use and care.

• **HOW TO USE AND TAKE CARE OF FILES** *is elaborately covered in Nicholson's famous 48-page illustrated book,* "FILE FILOSOPHY." *How many copies for "key" uses shall we send you?* FREE.

NICHOLSON FILE CO. • 27 ACORN STREET, PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

MATERIAL HANDLING News

Here, for a fact, is . . .

- **Industry's No. 1 handling job . . . that multitude of items weighing 200 to 1000 lbs.**
- **Industry's No. 1 opportunity . . . for substantial savings . . . and**
- **Industry's No. 1 answer . . . the CLARK TRUCLOADER.**

Take fruits and vegetables, for instance, or other perishables—here 24 boxes of apples are handled without pallet by the Truckloader and Clark's Clamp-Lift, designed for that very job, at big savings of time, storage space and handling costs.

Wool and cotton bales, too—here two bales of fine blanket wool are taken by the Truckloader via 3000-lb. elevator to second floor storage; and a once tedious chore is done easily.

Rolls of fabric or paper weighing 450 to 600 pounds each are handled easily by the Truckloader. Damage losses practically ended.

Handling metal parts, setting up machining jobs, hustling castings to storage, replacing dies—there are literally a thousand-and-one jobs for the Truckloader.

Do not these successful applications suggest many ways by which you, too, can realize substantial savings with the Truckloader? This versatile machine can be either gas-powered or electric battery-powered. A practical first step is to CONSULT CLARK.

For helpful reading send for "Material Handling News."

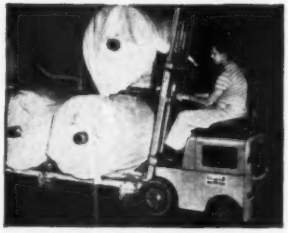
for the CLARK TRUCLOADER *these are naturals*

FRUITS and VEGETABLES *by the box*

or WOOL, COTTON *. . . by the bale*

or TEXTILES, PAPER *. . . by the roll*

or METAL ITEMS *. . . by the hundreds*



CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 12, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

and tube sheet junction are avoided, and that brazing scale is loosened by hydraulic stretching and blown out of coil, safeguarding against scoring. Kennard Corp., 1818 S. Hanley Rd. St. Louis 17, Mo.

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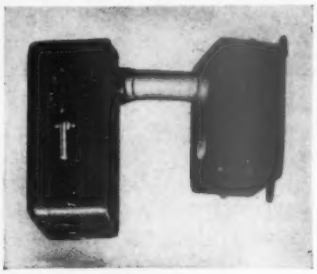

Smoke Indicator

Photoelectric smoke indicator, Type A20C-1, is designed to indicate the density of smoke passing through the flue or breaching of a heating or power plant, and to signal when this density approaches the values prescribed by municipal smoke ordinances. Device consists of a photoelectric control and light source, mounted on opposite sides of the flue. The light source beam is projected across the flue onto the photoelectric control. A sensitivity adjustment permits the equipment to be set so that it will signal when smoke density approaches preset value. Supplementary equipment includes bell alarm to signal excessive smoke, densimeters to give continuous indications of smoke density, and recorders to record the time of day at which excessive smoke passes through the stack. Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

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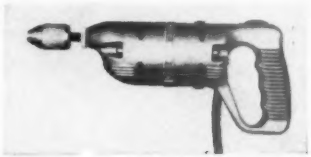


Light-duty Electric Drill

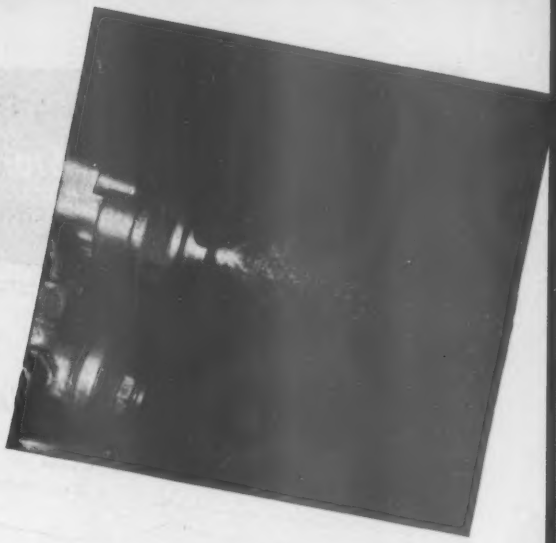
Delivering approximately 1/12th horsepower at the chuck, free load of ¼-in. electric hand drill is over 1200 r.p.m., according to the manufacturer. It operates on 110-120 volts, 50-60 cycles, a.c. or d.c. It weighs 3 pounds and has a die-cast aluminum alloy housing. Fairchild Industries, Inc., Burlington, Vt.

•

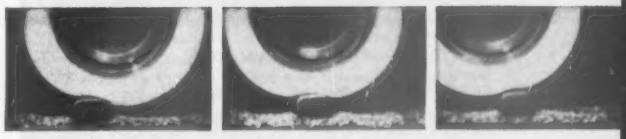
Warning Signal

Low-pressure warning device sounds an alarm when the pressure in the compressed air system falls below the minimum pressure for safe or efficient operation. Assembly consists of a valve element which automatically springs open when the air pressure drops below pre-selected value, allowing the escaping air to blow an integral whistle which continues to sound as long as the air pressure is less than that for which the valve is set. As soon as the pres-

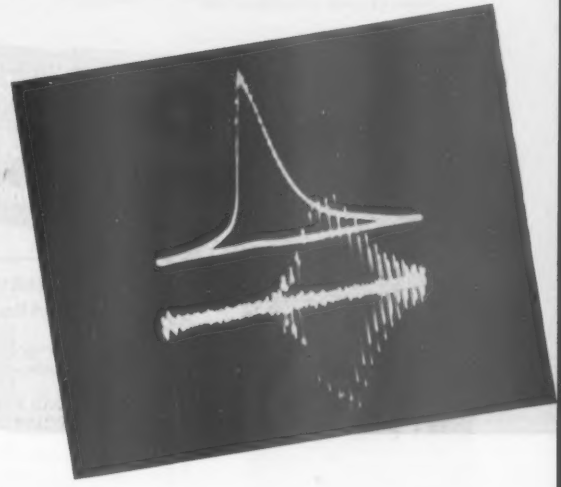
3 WAYS PHOTOGRAPHY STOPS TIME



1. HIGH SPEED STILLS—taken in as little as a millionth of a second—give you sharpest possible detail of a flash of fast action. They can be timed to catch the important instant of continuous motion. In the illustration, taken at 1/100,000 second, spray from a lacquer gun has been "stopped" to study dispersion of material.



2. HIGH SPEED MOVIES—slow down action far too fast to see otherwise—expand 1 second of operation into 4 minutes of viewing time. They allow the study of fast moving parts in operation—show why they stand up or fail. The illustration shows three frames of a high speed film made to study the action of a tire meeting an obstacle at high speed.



3. RECORDING OSCILLOGRAPH TRACES. When fast actions can be translated into electrical impulses, they can be traced on the oscillograph and photographed. In the illustration, the upper trace represents the pressure of detonation in the cylinder of a knocking gasoline engine—the vibrations in the lower trace have a period of about 1/100,000 second.

FUNCTIONAL PHOTOGRAPHY

... is advancing industrial technics

Camera close-ups, like these from the automotive industry, are helping unravel problems for all kinds of industries and businesses. They are pointing the way to better products at less cost—to more efficient production methods—to greater ability to lead competition.

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Eastman Kodak Company, Rochester 4, N. Y.

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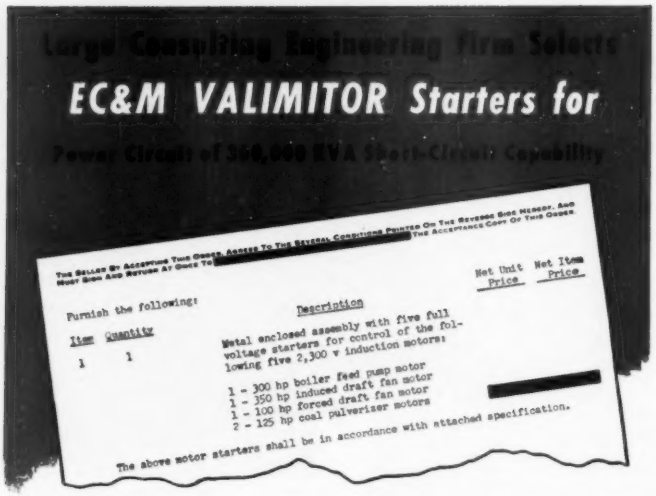
Large Consulting Engineering Firm Selects

EC&M VALIMITOR Starters for

Power Circuit of 300,000 KVA Short-Circuit Capability


Net Unit Price
Net Item Price
Furnish the following:
Item
Quantity
1
1
Description
Metal enclosed assembly with five full voltage starters for control of the following five 2,300 v induction motors:
1 - 300 hp boiler feed pump motor
1 - 350 hp induced draft fan motor
1 - 100 hp forced draft fan motor
2 - 125 hp coal pulverizer motors
The above motor starters shall be in accordance with attached specification.

"The power circuit which will supply this assembly has a short-circuit capability of 300,000 KVA at 2300 volt, and the units shall be suitable for operation under these conditions," say the specifications. EC&M VALIMITOR Starters not only meet these conditions, but will provide *safe* operation even if connected to a bus of *infinite* available KVA. There's no limit on VALIMITOR protection—no need to calculate present power—no need for revision if KVA grows. They reduce the effect of a "fault" not only on the immediate motor circuit, but limit the fault current clear back to the power source. EC&M VALIMITOR Starters are easy to apply—order them by motor name-plate data.

Unlimited
SHORT CIRCUIT Protection
at One Cost

SWITCH TO EC&M VALIMITOR
Starters for all these features

1 SHORT CIRCUIT Protection regardless of available KVA.
2 OVERLOAD Protection.
3 LOW VOLTAGE Protection.
4 CUSHIONED STARTING—gives a smoother start and lower inrush current—improving starting conditions—may save cost of more expensive reduced voltage starter.
5 NO REPLACEMENTS to restart, after a fault.

Write for No. 23 ACCELERATOR Issue describing these Starters

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

sure returns to the value above the set point, valve automatically closes, and whistle stops blowing.

Available in adjustable and non-adjustable types. The adjustable type is arranged so that both the pressure setting and the tone of the whistle may be adjusted in service. The non-adjustable type is permanently set at the factory for a specified pressure. Both types have a ½-in. NPT inlet connection, but manufacturer states that this may be bushed to any size desired, as the air requirement of the device is quite small. Airlarm, Box 6024, Houston 6, Tex.

•

Crane

Mounted on a Model UTI Minneapolis-Moline tractor, the Handi-Crane has a lifting capacity of 4 tons. Steering gear with roller bearing knuckles permits easy steering and small size allows crane to work in congested areas. It revolves 320 degrees, so that loads can be picked up, carried, or spotted on either side. The all-steel, welded boom is raised and lowered by means of a hydraulic cylinder that permits independent boom topping. The hydraulic cylinder and boom are mounted on a turntable that rides between two rows of large-diameter steel balls. Operator's seat is offset to provide full visibility, and all controls are grouped within convenient reach for easy operation. Clyde Iron Works, Inc., Duluth 1, Minn.

•

Photoelectric Control

Single unit outdoor lighting control, Series 62405, for interval night illumination, consists of a light sensitive photo relay, to turn on lights at a preset value of daylight, and an automatic time-switch, which turns them off at any preset time during the night. Time-switch can also be set to turn on lights early in the morning, permitting them to remain on until the daylight reaches sufficient intensity to activate the

SHREDDING

THE PREPARATION OF MATERIAL

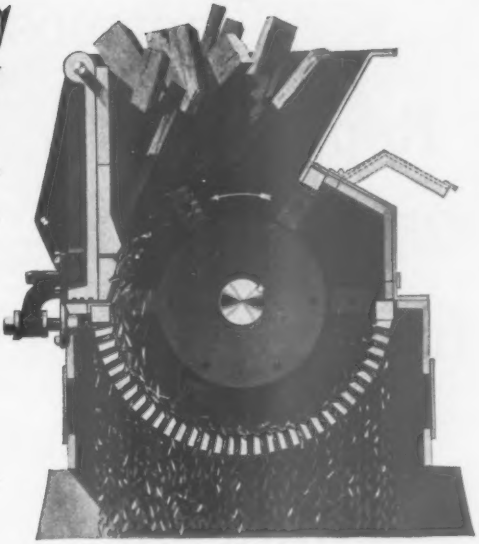
During Processing Operations
Reducing Waste Material for making a by-product
Salvage Purposes
Use as fuel

MANY INDUSTRIES SERVED BY JEFFREY SHREDDERS

Pulp and Paper Mills
Sugar Refineries
Extract Plants
Chemical Plants
Turpentine and Rosin Plants
Citrus Fruit Plants—Canneries
Sewage Disposal Plants

MANY MATERIALS REDUCED

Sugar	Cork	Insulating Materials	Pulp Laps
Bagasse	Screenings	Drugs	Shavings
Chips	Citrus Fruit	Chemicals	Magazines
Knots	Straw	Plastic	Cornstalks
Slivers	Wood		Rubber

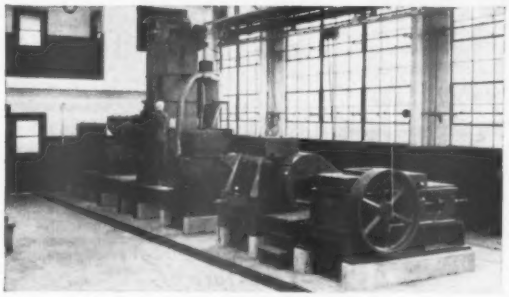


TYPE B HAMMER HOG (above)

Ideally suited for the reduction of wood refuse containing nails, spikes. No sharp edged knives to require frequent sharpening—no damage to working parts. This and other types shown and described in Catalog No. 805.

HIGH CAPACITY UNIFORM REDUCTION

Jeffrey Shredders are well built and properly designed — in various types for handling the different classes of material — a wide range of sizes — some with metal catchers — to suit capacity requirements.



Our modern test laboratory (left) enables us to determine the proper type and size of machine best suited to the need in advance of expenditure or installation. Sample of material may be furnished, if desired, with results kept in strict confidence.

●

PULVERIZERS ● SINGLE ROLL CRUSHERS
DOUBLE ROLL CRUSHERS
FLEXTOOTH CRUSHERS
ROTARY RING CRUSHERS ● BALE BREAKERS
METAL TURNINGS CRUSHERS
SEWAGE SCREENINGS & GARBAGE GRINDERS
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Established 1877

911 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

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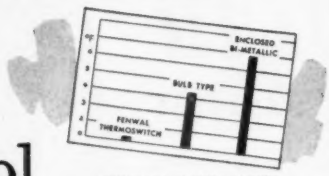
Birmingham 3	Cincinnati 2	Harlan	Milwaukee 2	St. Louis 1
Boston 16	Cleveland 13	Houston 5	New York 7	Salt Lake City 1
Buffalo 2	Denver 2	Huntington 19	Philadelphia 3	Scranton 3

$7.50 Thermostat Replaces $250 Control Instrument ...and Eliminates Maintenance Costs!



BUILT TO STAND ABUSE
Chart shows the change in the set point of a Thermoswitch* Control in comparison to two other types of thermostat when subjected to a mechanical shock of 100 G.

BECAUSE the Fenwal Thermoswitch* is *fast ... accurate ... rugged ... compact ... easily installed* ... and the contacts are *fully enclosed* by the temperature-sensitive shell!

As in this actual solution to a common temperature control problem in the newspaper industry, you too may make amazing savings in heat control.

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THERMOSWITCH*
*Reg. U. S. Pat. Off.
The Precision Thermostat For Temperature Control and Over-and-Under-Heat Detection
SENSITIVE ... *but only to heat*

FREE! Get this bulletin ... see what the Fenwal Thermoswitch* can do for *you.*
Just fill in coupon and mail ... no obligation
FENWAL INCORPORATED, 23 Pleasant St., Ashland, Mass.

Name ..... *Position* .....
Company .....
Street .....
City ..... *Zone* ..... *State* .....

I am chiefly interested in the applications checked:

HEATING
☐ Incubators
☐ Vulcanizing
☐ Pasteurizing

COOLING
☐ Refrigeration
☐ Ventilation
☐ Quick Freezing

PROCESSING
☐ Canning
☐ Cooking
☐ Refining

SAFETY WARNINGS
☐ Engines
☐ Motors
☐ Transformers

HEATING
☐ Limit switches
☐ Oil burners
☐ Hot water tanks

LABORATORY EQUIPMENT
☐ Ovens
☐ Cabinets
☐ Liquid baths

OTHER (Please fill in your special requirements) .....
.....

photo relay, which shuts them off. Model 62405 operates on standard 115-volt a.c. circuit, Model 62406 on 230-volts a.c., both rated to handle 3,000 watts. Fisher-Pierce Co., Inc., 45 Ceylon St., Boston, Mass.

•

Asbestos Caulking Putty

Available in cartridge form with a caulking gun, caulking putty contains an asbestos fiber aggregate said to retain the oil and pigments, so that it will not dry out and fall away. For use on windows and monitors, it is available in tan, white, and gray, in cartridges containing approximately 1/10 gallon, in pint or quart cans, or other sizes up to 50-gal. drums. Johns-Manville, 22 E. 40th St., New York 16.

•

Slimline Lamp Fixture

Two-lamp fixture, called Silv-A-King, is designed to use G. E. Slimline lamps. It is made of heavy-gage metal and has an attachment called E-Z Lock for quick assembly or disassembly of the reflector from the hood without disturbing wiring and auxiliaries. Side-grip grooves run the entire length of the unit to permit a variety of installations. Spring-action lampholders hold the lamps securely, yet allow easy insertion and removal, according to the manufacturer. Bright Light Reflector Co., Inc., Fairfield & State Sts., Bridgeport, Conn.

•

Portable Safety Transformer

Designed to safeguard workers in damp or wet locations from electric shock, portable safety transformer weighs 4½ pounds, reduces a 110-volt circuit to 6 volts. Called Saf-T-Lite, the transformer is protected by a strong waterproof Bakelite casing. When connected to an outlet, the unit can be left on floor or table, or hung from any wall fixture. Larger model, designed to step 220-volt lighting circuit down to 32 volts, is contained in a portable impact-resistant steel casing, for use where increased wattage for general lighting is desired, but under conditions which do not expose the user to the type of hazard for which the 6-volt

Putting Air to Work!

● Sailing vessels represent one of the oldest and most romantic methods of putting air to work. Long before the Christian era seamen were setting sails to harness the tradewinds. And still today, countless vessels utilize one of nature's most power-laden forces, the air currents, to drive them on their way.

Putting air to more controlled and even greater productive work has been a specialty of The DeVilbiss Company for more than 60 years. Beginning with the ingenious harnessing of air to atomize liquids in the form of a spray, DeVilbiss has steadily perfected and improved spray equipment and methods to their point of great productivity and paramount efficiency which we know today. It is the knowledge and experience which comes from such pioneering that makes DeVilbiss Equipment widely used around the world and throughout all industry.

DeVilbiss finishing systems end costly time-consuming methods . . . conserve manhours . . . stop material waste . . . knock the bottom out of finishing costs . . . improve product quality. If you are confronted with the necessity of lowering finishing costs while still maintaining maximum quality—consult DeVilbiss.

THE DEVILBISS COMPANY • Toledo 1, Ohio

Canadian Plant: WINDSOR, ONTARIO

This DeVilbiss MBC Spray Gun is widely used and enthusiastically endorsed throughout the world. You'll find it coating an infinite variety of products with finishing materials of every description and doing the job better, faster and for less.

DE VILBISS *means* **Quality** *in all four . .*

SPRAY EQUIPMENT
EXHAUST SYSTEMS
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HOSE & CONNECTIONS

KESTER

the Greatest Name in Solder!

THERE is a reason for Kester's tremendous success in the industrial field. A staff of highly-trained technical engineers and a half-century of Kester "know how" are teamed to bring you the finest flux-core solders made.

As a measure of this ability, Kester produces over 100,000 different types and sizes of flux-core solders.

Contact Kester's Technical Department on your soldering problems. There is no obligation.

WRITE FOR THE NEW, FREE MANUAL—"SOLDER AND SOLDERING TECHNIQUE"

A complete analysis of the application and properties of soft solder alloys and soldering fluxes.

1899 50th Anniversary 1949

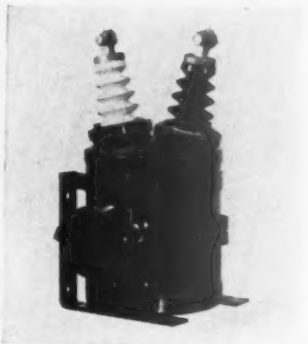
KESTER SOLDER COMPANY
4201 Wrightwood Avenue Chicago 39, Illinois

FACTORIES ALSO AT NEWARK, NEW JERSEY • BRANTFORD, CANADA

KESTER SOLDER

unit is designed. Both the 6- and 32-volt models are furnished either with trouble-lamps and 25 feet of heavy insulated extension cord, or as only safety transformers with insulated leads. Etraco Mfg. Co., Inc., Woods Church Rd., Flemington, N. J.

•



Outdoor Instrument Transformer

Designed for outdoor service and suitable for operating meters, relays, and control devices, instrument transformer, Type JEA-3, is of sealed construction with a bracket for mounting in vertical, horizontal, or inverted position. Device is available in ratings of 2400 (120 volts), and 4800 (120 volts), 60 cycles. Both have insulation for a 60-kv., full wave impulse level. Core and coils are impregnated with an asphalt base compound of high dielectric strength, making them impervious to moisture. Primary terminals are brought out through porcelain bushings on the top of the transformer, secondary terminals are threaded studs in a weatherproof compartment on the sheet-steel case. Meter and Instrument Div., General Electric Co., Schenectady 5, N. Y.

•

Aluminum Paints

Line of aluminum paints for industrial maintenance includes several formulations, each designed for a specific surface or use, and each meeting government specifications for the applications for which it is intended. Line includes paints for metal and masonry for exterior wood, and interiors; type called I-M Super-Spar is formulated to withstand severe underwater exposure; while another type, prepared for high heat resistance, is said to give good service on surfaces heated up to 1000 degrees F. Hastings & Co., 2314 Market St., Philadelphia 3.

Valves

•

For applications which require accurate regulation of steam, water, air, or gas at inlet pressures less than 250 pounds, reduced pressures below 150 pounds, and where reduced pressure must be adjusted frequently, line of valves, called the 400 series, are single seated with a ball-type inner valve actuated by a rubber diaphragm. The ball is said to center freely on the seat with uni-

The Foreman of this progressive shop (left) consults with a Gulf Lubrication Engineer on results with Gulf L.S. Cutting Base in machining clock parts.

Costs Down-Production Up!

"We've sharply reduced time per piece, improved surface finish, and greatly extended the number of pieces per tool grind since we switched to Gulf L.S. Cutting Base," says this Foreman of Main Screw Machine Products, Inc., Waterbury, Conn.

"On our new ¾" automatics we are performing two turning, one threading, and one cut off operation on a steel clock part at the rate of 1.2 seconds per piece. With the cutting oil we used previously the time per piece was much higher."

"Just as important to us has been the increased number of pieces per tool grind. With Gulf L.S. Cutting Base we are now running 16,000 pieces before regrinding of the tools is necessary. Add the fact that we are getting better finishes, and you can see why we're gratified by our experience with this fine cutting oil."

Here's another example of how the proper application of the right Gulf quality cutting oil improves production and lower costs. To make sure that you're getting all the benefits possible through the use of more suitable cutting oils, call in a Gulf Lubrication Engineer today.

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when you're glad you have a Snap-on

Snap-on's Heavy-Duty Blue-Point Boxockets give you powerful leverage to turn those stubborn, large size nuts and bolts. There is no danger of slipping for Boxocket openings completely encircle the nut . . . giving equal pressure on all six corners. You can really "bear down" and complete the job quickly and safely. Each wrench head has a locking button which engages a lock hole in the handle requiring deliberate action to unlock the combination.

The double hexagon broaching gives you the additional advantage of a short turning arc where obstructions restrict free swinging. Sizes available from 1 1/16" to 3 1/8" with four handles from 18" to 36". Direct factory branches in 40 key industrial cities.

Pulling up bearings on Swing and Traction Reverse Shaft.

SNAP-ON TOOLS CORPORATION
8044-C 28th AVENUE, KENOSHA, WISCONSIN

form contact all around, closing tightly when seated. When off the seat, the ball is free to turn, so that all parts are exposed in turn to the action of the flow. Manufacturer states that the smooth passage between the ball and seat bevel permits a high flow capacity. Klipfel Mfg. Co., Div., of Hamilton Thomas Corp., Hamilton, Ohio.

•

Magnetic Strain Gage

The magnetic strain gage, designed to measure small distortions in a static member resulting from a tensive or compressive load, may be used as a warning to the operator when a crane is in danger of upsetting due to overloading, or on other metal structures where variations in load may approach safe limits of the supporting member. Unit consists of the strain gage enclosed in a 2½x 8¼x3¼-in. watertight case, a pilot bar sensitive to a force as small as 20 pounds, which is rigidly mounted on the supporting member, and a controller with indicating dial located wherever desired near the operator. Operation is from a single-phase, 110-volt, 60-cycle supply. Voltage and frequency variations should not exceed ±3 per cent; 35 volt-amperes required. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

•

Heat Exchanger

Intended for horizontal operation, heat exchanger, Style FH, size 1½, is suitable for heating or cooling corrosive fluids, particularly in tanks with liquid depths up to 16 inches. It consists of two impervious graphite tubes of 1½-in. I.D. x 2-in. O.D. in a parallel flow bank between headers. Connections for the heating or cooling medium are made with neoprene connectors. Manufacturer states that the impervious grapnite has high thermal conductivity, and is resistant to the action of most corrosive, solvent, or reducing agents. National Carbon Co., Inc., 30 E. 42nd St., New York 17.

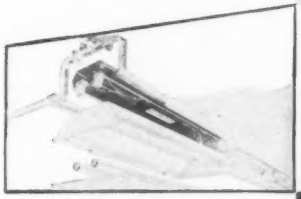
•

Non-repeat Punch Press Attachment

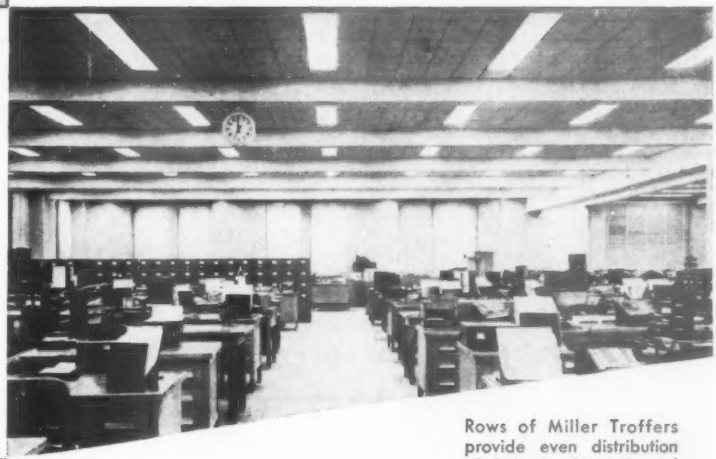
Non-repeat attachment, designated Cat. No. 77, is suitable for use on punch presses, press brakes, power shears, and similar clutch-operated machinery. Applicable for use with foot, hand, electric, or air tripping methods, one-stroke safety device automatically disconnects the clutch trip rod from the foot or hand trip at the completion of each tripping stroke, regardless of how long the tripping lever is held down, removing the accident hazard of an unexpected stroke. Manufacturer states that unit is a universal-type "pack-

Important reasons for specifying miller fluorescent troffer lighting systems

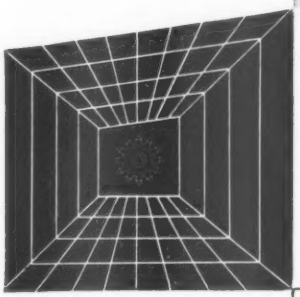
2



The patented Miller Ceiling Furring Hanger simplifies installation — makes it possible to arrange Troffers to form ceiling patterns as desired — CEILINGS UNLIMITED*. Channels are Bonderized for rust resistance.



Rows of Miller Troffers provide even distribution of light in this industrial office area.



MILLER Troffer installations result in a finished lighting and ceiling job, adequate in illumination, architecturally pleasing, structurally sound and economically produced. Their versatility of application increases the functional value of lighting.

MILLER LIGHTING SERVICE IS ALL-INCLUSIVE covering needs of planned commercial and industrial lighting. Miller field engineers and distributors, conveniently located, are at your call.

THE miller COMPANY

SINCE 1904

ILLUMINATING DIVISION, MERIDEN, CONNECTICUT

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment. HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices. ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

*Reg. Trademark U. S. Pat. Off.

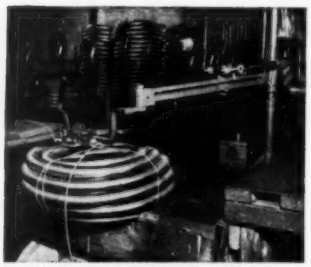
The "Strapping Twist" that saves time and money - GERRARD

The use of Gerrard Round Steel Strapping will cut your material costs 30 to 50 percent.

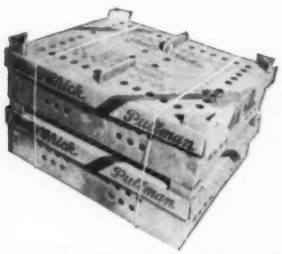
The simplicity of Gerrard Steel Strapping operations will speed up binding and packaging procedures. Every Gerrard machine tensions the strapping, forms its own twisted seal, trimmed smooth with no exposed ends.

And the Gerrard method gives unrivaled protection. Packages are securely bound into rigid, pilfer-proof bundles. In crates, cartons, palletized loads, and carload lots of steel pipe, sheets and machinery, torsional sway is practically eliminated and damage claims are sharply reduced.

Gerrard Round Steel Straps come in a wide range of gauges to satisfy every commercial and industrial need. Gerrard Engineers will gladly help you solve your packaging problems. Their services are available *free of charge*. Write for our free books, *Blue Book of Packaging, Red Book of Carload Stowage* and *Q Model Semi-Automatic Bundling Machine.*

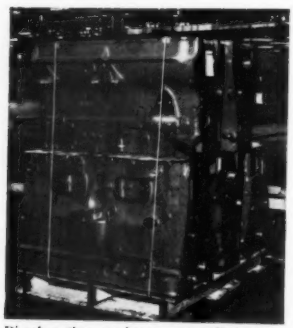


Flexible metal hose will remain rigidly strapped until it reaches its destination. Note suspension mechanism which makes Gerrard machine instantly available over the working area.



The risk of pilferage and the chilling dangers of lid-lifting are entirely eliminated when you bind chick boxes with Gerrard Round Steel Strapping.

Q Model head is set into a conveyor system for bundling cartons. Its semi-automatic operation helps keep production line moving rapidly. Q Model automatically tensions, ties, cuts and sets strapping for the next operation.



Diesel engine crankcases are palletized for inter-plant movement. Load of 3800 lbs. is secured to the pallet by two Gerrard Steel Straps. *Photo courtesy International Harvester Company, Industrial Power Division.*

USS

GERRARD STEEL STRAPPING COMPANY
(Formerly The Gerrard Company, Inc.)
2927 West 47th Street, Chicago

UNITED STATES STEEL

aged" unit and can readily be installed on any machine. W. I. Martin & Co., 711 S. Dearborn St., Chicago 5.

•

Tool Chest

Constructed of heavy-gage steel, reinforced and welded, tool chest, called Superchest No. 2001, contains a variety of tools, including Supersockets and attachments in ¼-, ⅜-, ½- and ¾-in. drives; Superwrenches, pliers, chisels, screwdrivers, and other tools totaling 146 pieces. Drawers operate on free-acting suspension slides. Removable top tray; separate compartments for sockets. Cylinder lock on hinged front securely locks entire chest. Also available are 35 matched assortments of various types and sizes of tools in popular drives with openings from 3/16 to 2⅜ inches, selected and grouped for specific uses. J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y.

•

Ceiling Receptacle

Combination 3¼-in. and 4-in. keyless ceiling receptacle, No. 277, measures 5 inches in diameter, making it 1 inch bigger than the conventional ceiling receptacles. This extra size is said to minimize installation difficulties caused by chipped plaster by providing an overlapping circumference. Made of white urea or brown Bakelite, unit has heavy terminals, solid rivets, and large binding head screws suitable for No. 10 wiring. A smaller ceiling receptacle, No. 276, is also available for combination use on either 3¼- or 4-in. boxes. Slater Electric Mfg. Co., Woodside, N. Y.

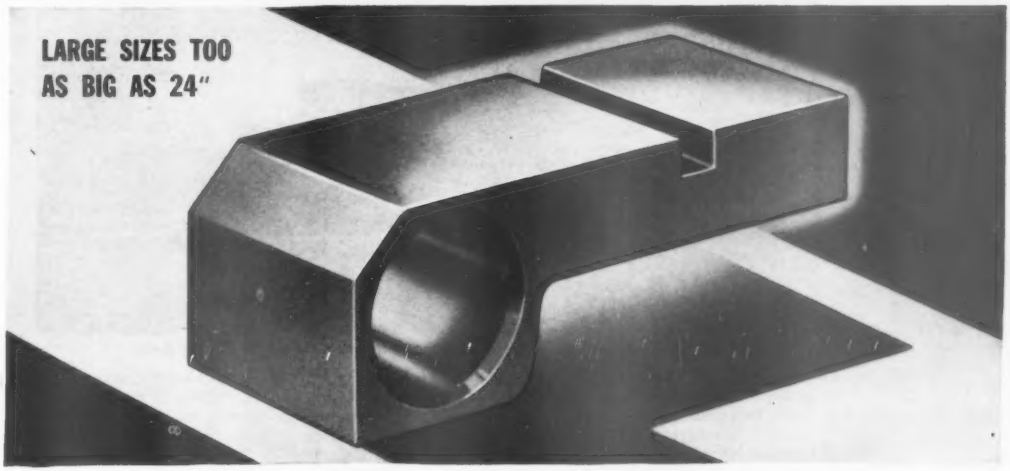
•

Inside Finish for Incandescent Lamps

White finish, which acts as a diffuser of light while permitting high light transmission, is being used in manufacturer's 100-watt lamp, a 100-200-300-watt three-light lamp, and a 150-watt indirect light lamp. The 100-watt and the three-way lamps resemble inside frosted lamps of the same wattage in size, shape, and length of life. The 150-watt indirect lamp has no counterpart among inside frosted types. It has the shape of a sun lamp, with face of the bulb 5 inches in diameter. General Electric Co., Lamp Dept., Nela Park, Cleveland.

OILITE

Finished MACHINE PARTS



with NO Machining...

Finished OILITE parts made from metal powders offer you many advantages including the following:

- ★ Precision parts at lower cost.
- ★ More than 20 types of machining operations eliminated.
- ★ Mass production even on designs involving profiling and "depressions".
- ★ No capital investment or tooling programs on your part.
- ★ Parts impossible to machine economically can be made readily of OILITE—allowing you greater freedom of design.
- ★ Complete engineering service at plant and in the field.
- ★ Parts of either ferrous or non-ferrous materials.
- ★ Metallurgically and structurally homogeneous—no imperfections.
- ★ Self-lubricating surfaces if desired.
- ★ Quicker delivery assured.

Send your blueprints to Field Engineer or Home Office. Address Dept. J

AMPLEX MANUFACTURING CO. DETROIT, 31 MICHIGAN

Division of Chrysler Corporation

FIELD ENGINEERS AND SUPPLY DEPOTS IN PRINCIPAL CITIES

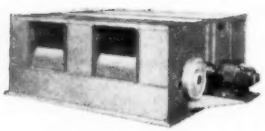
Westinghouse Air Conditioning System with Kathabar Humidity Control installed by Natkin & Co.

The Shell Oil Company was about to invest $1,300,000 for a new laboratory in Houston, Texas, for oil research. Plans called for extremely critical atmospheric condition control. Temperatures and humidity had to be held constant within close limits. It was essential that the air be kept as free of dusts and pollens as modern science would permit. Laboratory fumes had to be eliminated quickly. Westinghouse Air Conditioning with PRECIPITRON*, the electronic air cleaner, supplied the answer to the air cooling and air cleaning problems—not with special equipment, *but with standard, matched, Westinghouse components.*

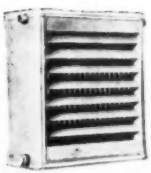
Expensive "special" jobs can often become routine jobs when you specify Westinghouse, because Westinghouse makes more products to put air to work in more different ways, than any other manufacturer. This means undivided equipment responsibility, coordinated system operation, flexibility and economy—important benefits that can hardly be overlooked when you are thinking about air conditioning, air handling, or air cleaning. Call your nearest Westinghouse office, Air Conditioning Distributor, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

Westinghouse

Sturtevant Division

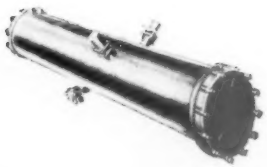


AIR HANDLING UNITS



UNIT HEATERS

CENTRIFUGAL FANS



REFRIGERATION CONDENSERS

HOW SHELL BOUGHT PRECISION AIR CONDITIONING FOR LABORATORY ATMOSPHERE CONTROL

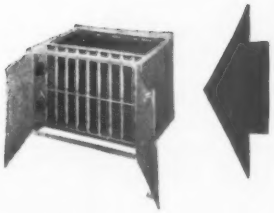
REFRIGERATION COMPRESSORS

EVAPORATIVE CONDENSERS

HEATING AND COOLING COILS

UNIT AIR CONDITIONERS

ROOM AIR CONDITIONER



PRECIPITRON*
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Everything that puts air to work for Every application

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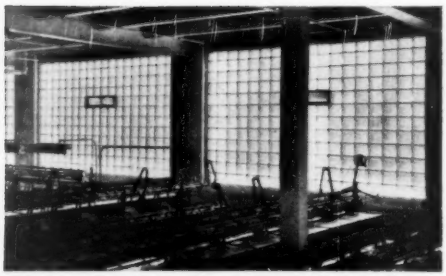
*Reg. U. S. Pat. Off.

Save money

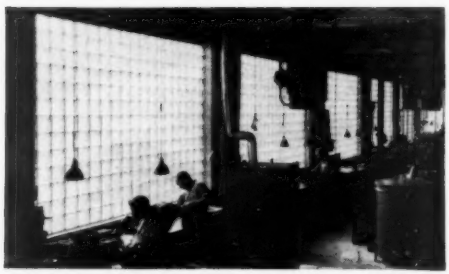
replace it with economical Glass Blocks

● When you replace your old, worn-out window sash with economical PC Glass Blocks, you save in three ways: *On maintenance.* PC Glass Blocks rarely, if ever, need repairs or replacement. No expensive washing of small, individual panes is necessary. No painting is required. *On heating and air conditioning.* PC Glass Blocks have excellent insulating properties; their *hollow* construction, creating a partial vacuum, or dead-air space, gives twice the insulating value of ordinary single-glazed windows. *On artificial lighting.* PC Glass Blocks admit floods of natural daylight over wide working areas. It's a clean, clear light—softly diffused. There isn't the dust, dirt and grit infiltration so common with ordinary sash. Moreover, your sash replacement program is readily adaptable to your budget. The complete job can be done at once, or just one opening at a time.

But why not get the *whole* story? It's told, fully and with many actual installation photographs, in our new booklet. Just fill in and return the coupon below for your free copy.



Where delicate machinery or materials are affected by heat, cold, or moisture, the insulating value of PC Glass Blocks is particularly effective.



Better lighting means better "seeing." Quality of workmanship is improved; artificial lighting is reduced, with PC Glass Blocks.

An occasional washing with a hose, a long-handled brush, or just wiping the panel with a damp cloth. That's all that's required to keep PC Glass Blocks clean.

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GLASS BLOCKS..

DISTRIBUTED BY PITTSBURGH PLATE GLASS COMPANY

on sash...

Haffner Associates, Inc., manufacturers of fine fabrics, must protect the operations in their plant from sudden temperature changes, condensation and dirt infiltration. A sash replacement program, using PC Glass Blocks, helps provide this protection and gives plenty of soft daylight—contributes to more comfortable working conditions for employees.

It's hollow!

This forms a partial vacuum, or dead-air space, which gives PC Glass Blocks twice the insulating value of ordinary single-glazed windows.

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Without obligation on my part, please send me a FREE copy of your booklet on the use of PC Glass Blocks in industrial construction.

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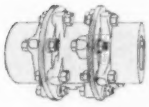
THOMAS Flexible ALL METAL COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.



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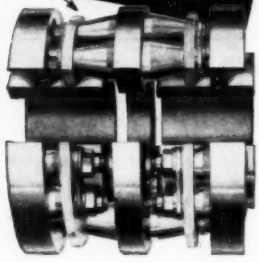

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WARREN, PENNSYLVANIA

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

BOOK, "Federation of British Industries Register of British Manufacturers—1948-9." 792 pages. Approximately 6,000 firms listed under headings covering more than 5,000 products. Tabularly indexed under Products & Services; Advertisements; Addresses; Brands & Trade Names; Trademarks. Overseas Directorate, Federation of British Industries, 41 Buckingham Palace Rd., London SW1, England.

"INDEX OF MILITARY PROCUREMENT" shows which military purchasing offices responsible for buying specific products. Addresses listed. Munitions Board, National Military Establishment, Pentagon Bldg., Washington, D.C.

TIME COMPUTER SLIDE shows elapsed time to nearest 1/100 and 1/10 of an hour. 24-hr. capacity. May be used with standard 12-hr. or continental 24-hr. clock. 10x4¾ inches; made of vinylite with plastic covering the printing. The Hourmaster, Box 533, Westfield, N. J.

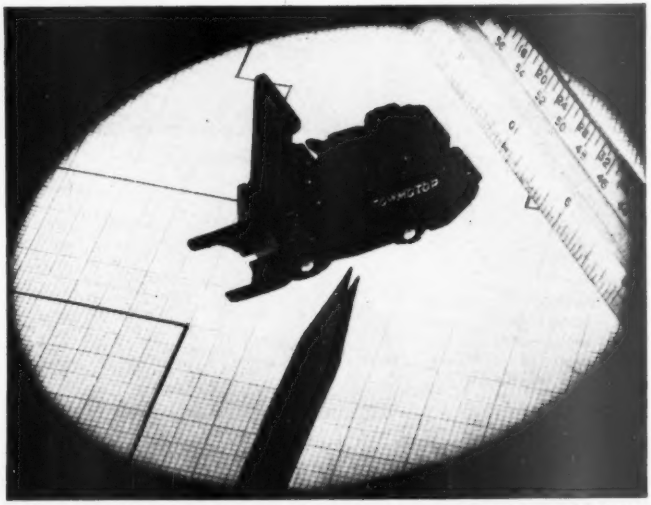
"NEW PRODUCTS AND SERVICES—1949 edition." Descriptions of items, addresses of makers. 48 classifications. Manufacturer and product indexes. The Journal of Commerce, 63 Park Row, New York 15.

CALCULATING WRIST WATCH with precision slide rule built around dial. Slide index automatically controlled by turning rim into which watch crystal is set. 17-jewel Swiss movement, in stainless steel or 18-karat gold. Juvenia Watch Agency, 604 Fifth Ave., New York.

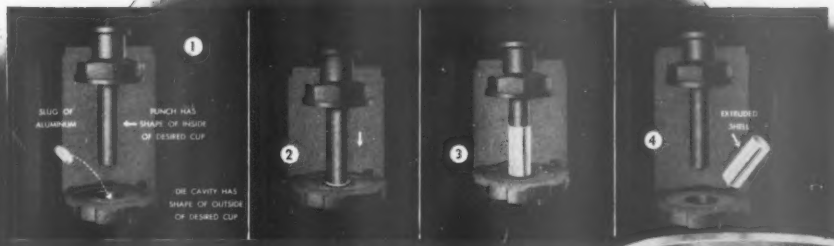
CARTOON BOOKLET, "The Plot to Steal the World." Anti-communist. N. J. Manufacturers' Association, 363 West State St., Trenton 8, N. J.

THICKNESS GAGE for fibrous materials such as jute, sisal, wool, glass fibres. Called Measure-Matic. Also measures resilience of compressible and deformable materials. Gustin-Bacon Mfg. Co., 1412 W. 12th St., Kansas City, Mo.

RADIUM STANDARDS developed for calibration of Geiger counters, other instruments measuring radioactivity. Conventional radium salt capsules; also, calibrated source



SCALE-MODEL LIFT TRUCK rolls on tiny wheels, carries scale-model loads. For use in visual planning of materials handling routes. Towmotor Corp., 1226 East 152nd St., Cleveland 10.



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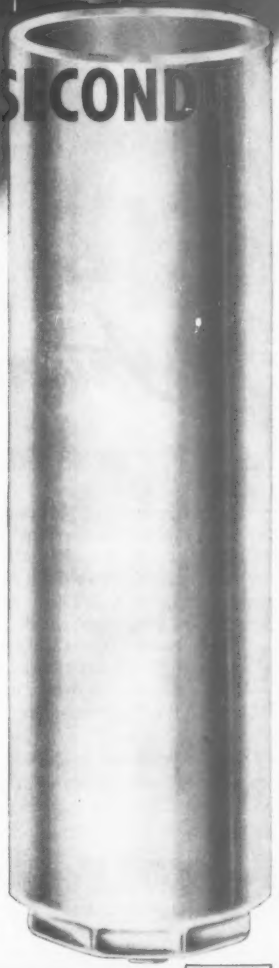
Grease Gun Cylinder Impact-Extruded by Alcoa with Integral Octagon Nut, Walls Heavy Enough for Thread Cutting

There's no laborious machining in the production of this grease gun cylinder, with heavy sides and bottom, octagonal nut, walls heavy enough for strong threads! One swift stroke of the Alcoa Impact Extrusion Press produces this shape in light, strong Alcoa Aluminum.

Thick or thin walls, cylindrical or square, heavy bottom or with integral boss, neck, lug or stem; there's almost no limit to the symmetrical shapes this Alcoa process makes possible at low cost.

For housings, shells, chambers, bodies, or cylinders, up to 5″ diameter and 16″ long, you should have full facts on the Alcoa Impact Extrusion Process. Write today for your copy of the booklet shown, or call your nearest Alcoa sales office. ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh 19, Penna.

Write for your free copy of "Alcoa Aluminum Impact Extrusions", 44-page booklet crammed with photos, diagrams and other information for designers.



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Company_____

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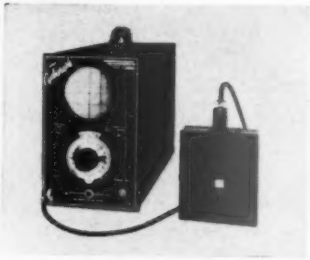
based on incorporation of radium or related elements in foil. U. S. Radium Corp., 535 Pearl St., New York.



METAL PARTS ANALYZER for quality control, sorting. Called Model C. Cyclograph. Checks or sorts on basis of analysis, structure, hardness, case depth, and, in some cases, stress concentration. Portable; weighs 50 pounds. Operates on 115 volts, 40-60 cycles. Test coil may be placed up to 12 feet from instrument. J. W. Dice & Co., 191 River Rd., Grand View-on-Hudson, N. Y.

BOOKLET, "National Security Factors in Industrial Location." Study made by National Security Resources Board on strategic industrial dispersion; problems involved in evaluation of present location, consideration of plant relocation. Supt. of Documents, U. S. Government Printing Office, Washington 25, D.C.

PRINTED LABELS on pressure-sensitive adhesive material. For product identification, operating instructions, wiring diagrams. Any color, any die-cut shape. Mystik Adhesive Products, 2635 N. Kildare Ave., Chicago 39.

SPECTACLE-TYPE GOGGLE called Tuc-Away. Semi-cup plastic lens, clear, light, medium, or dark green. Full protection at sides, bottom; opening at brow to eliminate fogging. Weighs less than ⅝-oz. Watchemoket Optical Co., Inc., Providence, R. I.

BOOKLET, "This Thing Called Public Relations." 19 pages, illustrated with cartoon-type sketches. Peter L. Schauble, Haverford, Pa.

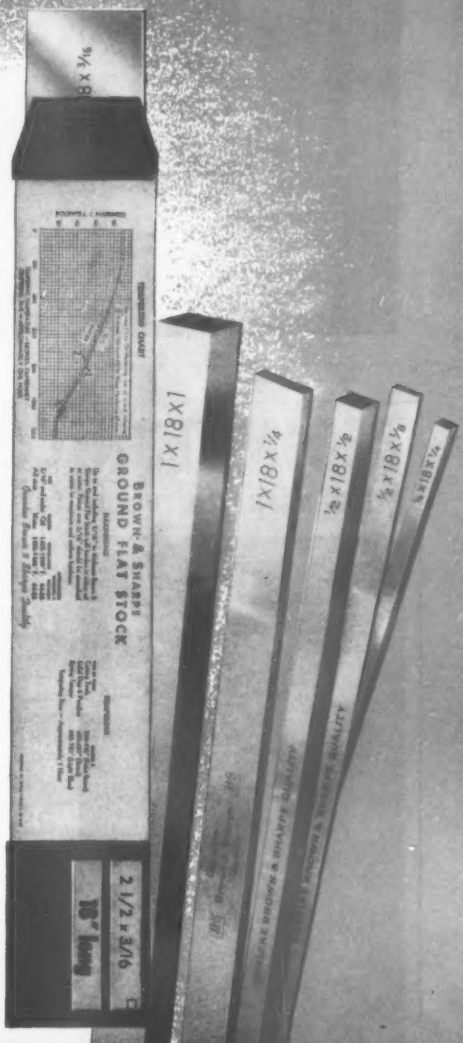
PLASTIC LINING for protection of drums, tanks. Cycloflex PC-11. A chemically inert membrane, resistant to corrosion and chemical attack, impervious to oxidation. Withstands wide temperature variations, high heat. High-gloss white or black. Munray Products, Inc., Div. of The Poly-Cyclo Products Co., Cleveland.

STEEL SUGGESTION BOX with 1, 2, or 3 panels for posters or bulletins. Hammer-tone silver finish on heavy-gage steel. Panels and box

An Important Cost Saver!

for templates, cutting tools, gages, test tools, machine parts and many other items . . .

Brown & Sharpe GROUND FLAT STOCK



SAVE TIME . . . SAVE MONEY

Here's one way to beat high costs. By making small parts from stock accurately pre-ground to size, you can avoid expensive, difficult grinding operations. What's more, you save man-hours and machines for more profitable work.

Brown & Sharpe Ground Flat Stock is accurate to within .001" in thickness. It is selected first-quality tool steel, annealed uniformly by a special process to make machining easy. Up to and including 3/16" in thickness, hardens in either oil or water to 64-66-Rockwell C. Pieces over 3/16" should be quenched in water for full hardness.

Brown & Sharpe Ground Flat Stock in 18" lengths is available in sizes that cover most requirements. Get an adequate supply from your Brown & Sharpe distributor. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Regular stock sizes include 13 different thicknesses from 1/64" to 1/2" . . . widths up to 6" . . . also square sizes. Individually packaged in clean, protective envelopes marked with size and heat treating instructions. Easy to store. Easy to handle.

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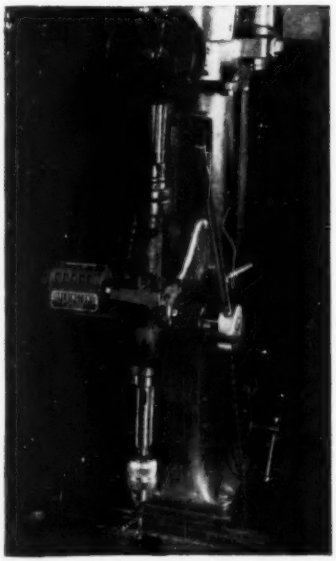
have a special value for your needs . . .



REDINGTON, "Watchdog of Production" offers you outstanding design and construction values you can truly "count on."

Working parts of best grade steel, strengthened for maximum service life—improved finish—Simplified reset mechanism saves time—New double injected plastic wheel—Easily read white figures cannot wear off, avoid errors in reading—Designed for easy cleaning and oiling.

IMMEDIATE DELIVERY. We make types for machines and production lines of many kinds. Counters can be shipped at once.

● Counter illustrated is mounted on bracket supporting drill press spindle. Sash chain is fastened to Counter lever and pin in collar of spindle. Counter lever is mounted to the rear and Counter is actuated when drill is lifted from jig or from piece being drilled. Sufficient slack is allowed in chain to permit raising and lowering of drill for clearing chips.

F. B. REDINGTON CO.
105 S. SANGAMON ST.
CHICAGO 7, ILL.

may be used separately. Elliott Service Co., Dept. M 10, 30 N. MacQuesten Pkwy., Mt. Vernon, N. Y.

ELECTRONIC COMPUTER solves problems in motion as they occur, calculates mathematical equations. Measures 2 feet square, 6 feet tall, contains 100 radio tubes. No moving parts. Works, any linear differential equation, prints answers on tape. One unit will perform 20 separate mathematical operations; two or more may be wired together for more complicated problems. Goodyear Aircraft Corp., Akron, Ohio.

FIRST-AID EYE KIT contains 15 eye-health items, including nonbreakable plastic magnifier called Magna-Clean Eye Particle Remover. $8\frac{1}{4}$x$4\frac{1}{4}$x$1\frac{1}{4}$-in. transparent plastic box. Ohio First Aid & Pharmacal Co., 1285 W. 6th St., Cleveland.

RECORDING INSTRUMENT plots, on circular chart, curve of number of operations against time. Called Running-Count Recorder. Total count of intermittent operations, time each occurs, hourly production rate, other information. The Bristol Co., Waterbury, Conn.

GERMICIDAL VAPORIZER, called Vapomatic, generates antiseptic mist of glycol, kills airborne bacteria, virus. Operates from standard outlet; heat generated by infra-red lamp. Merit Western Products Co., 2822 W. Valley Blvd., Alhambra, Cal.

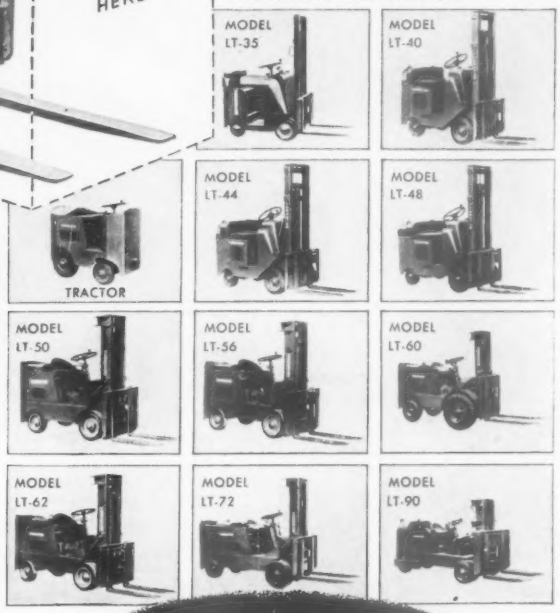
FILMS

Mighty Labors answers question "What is Industrial Engineering?" Illustrates, explains modern controls essential to economical production, including time study, methods engineering, job evaluation, plant layout, process charting, wage incentives. 16 mm., sound, color; 34 minutes. Industrial Engineering College, 3309 West Washington Blvd., Chicago 24.

Get MAXIMUM PRODUCTION

from both men and machines with TOWMOTOR MH*

*MH Is MASS HANDLING—the systematic movement of the most units, in the shortest time, at the lowest cost.



With Towmotor Mass Handling, men and production machines operate at peak efficiency. Maximum production at lowest cost is the result. Towmotor Fork Lift Trucks and Tractors, gasoline powered for full-time, full-power service, offer you every advantage and benefit of modern lift truck operation. There is a size for every type of plant, small or large. Numerous accessories and attachments further increase the adaptability of Towmotor Mass Handling to your particular handling job. Get maximum production at minimum cost all the way down the line. Use *Towmotor*, the Fork Lift Truck preferred by professional handlers everywhere.

TOWMOTOR
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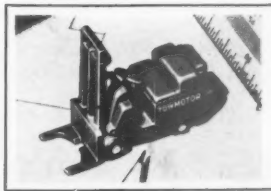
FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION



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actual scale ¼" = 1' $1.00 each

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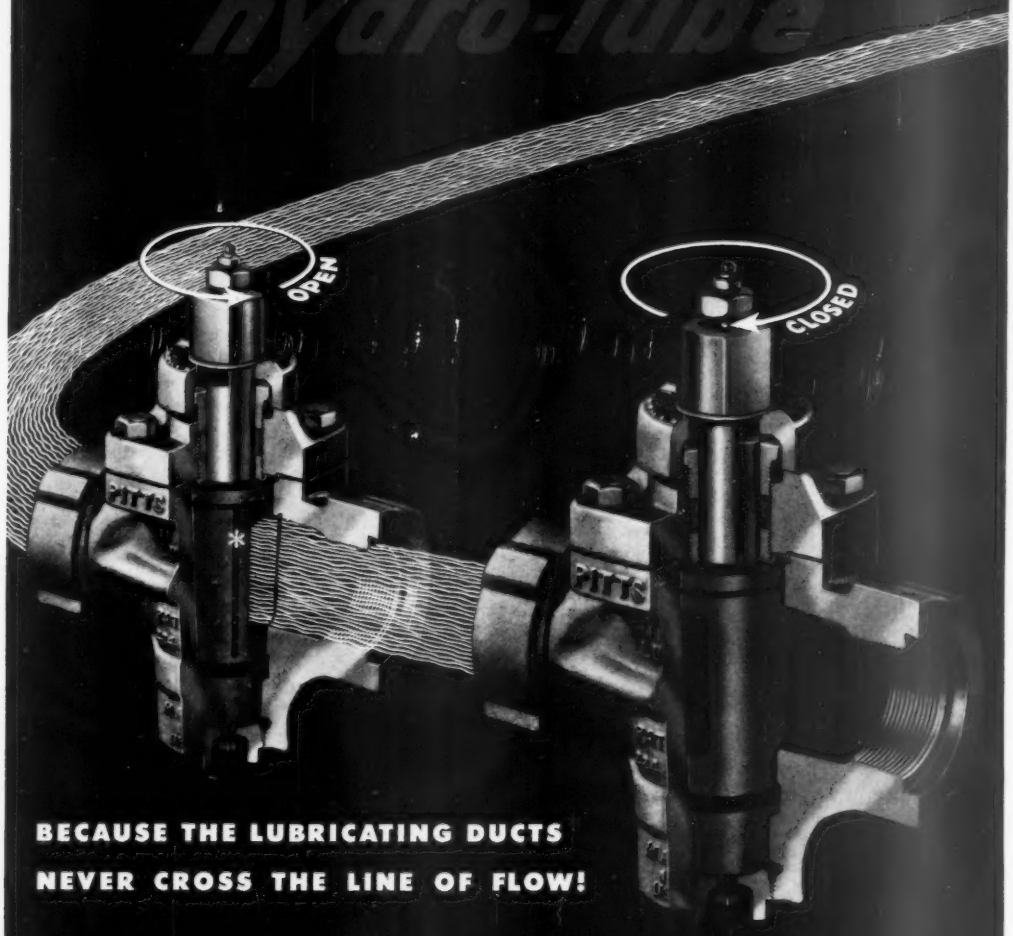

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PITTSBURGH VALVE & FITTINGS CORP.
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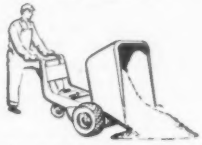
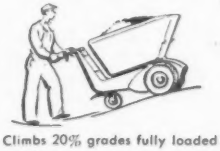
Bucket holds 10 cubic feet . . . 18 with sideboards

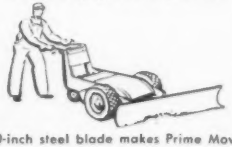


Mechanically dumped . . . operates by foot pedal

9-square-foot steel platform takes half-ton loads



Climbs 20% grades fully loaded



50-inch steel blade makes Prime Mover an efficient snow plow

FEATURES:

- gear driven . . . no belts or chains
- fully enclosed engine protected against dirt and moisture
- clutch, engine, transmission all run in oil
- switch from bucket to platform without tools . . . in less than a minute
- turns in its own length (63½"); width 31½"
- 3-gallon tankful of fuel gives 8 hours continuous service

A PRODUCT OF

BELL *Aircraft* CORPORATION

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From bricks to gears, fertilizer to flowers

The BELL *Prime Mover*

speeds production, saves manpower, cuts costs

Here are a few reports from industries now profitably utilizing the clear-cut advantages of the Bell Prime Mover . . . a machine combining the features of a giant motorized "wheelbarrow," a 9- or 14-square-foot platform truck of unusual mobility, and a sturdy, low-cost snow plow.

Georgia Vitrified Brick & Clay Co.: Reports savings of 40 man-hours a week, carting material from borrow bed.

Lima-Hamilton Corp.: "In hauling shavings and turnings, the Prime Mover is making 4-5 trips more per hour than one man with an ordinary wheelbarrow," writes John S. Dixon, assistant to the vice president.

Knoxville Fertilizer Company: Here a Prime Mover saves 8 man-hours daily transporting bagged fertilizer from mill to box cars and trucks.

Reading Greenhouses, Inc.: General Manager Harold Christensen writes about two Prime Movers used for changing soil in greenhouses: "They have practically revolutionized this laborious job. We have done away with our usual 8-man wheelbarrow brigade and now do the job with only two operators in just a portion of the time . . . we wonder how we got along before without them."

This quick round-up of Prime Mover success stories can have important implications in your business . . . for there are certain to be one or more operations in your own plant that can be done with Prime Movers . . . faster, with less manpower, at lower cost. Such jobs could include coal passing, ash removal, snow plowing, movement of bulk raw materials.

An on-the-job demonstration will quickly support this thinking. If you would like to see a Prime Mover or a fleet of them in action, a member of our nationwide sales and service organization will gladly arrange a demonstration. For more information, please sign this coupon, clip it to your letterhead, and mail it to us.

SEND COUPON NOW

Bell Aircraft Corporation
P. O. Box 1F3, Buffalo 5, N. Y.

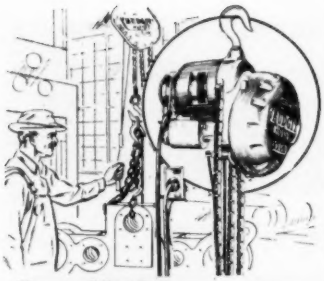
Please send facts on the Bell Prime Mover. Who is the nearest distributor?

Name .....

Company .....

Address .....

City, Zone & State .....



How MUCH you save

You'll never know how much time and money you can save in operating costs on production, assembly, and inspection lines until you install a portable 'Budgit' Electric Hoist to do your lifting of heavy machine parts or the machines themselves.

These small, portable hoists lift up to 4000 lbs. with incredible ease and speed and free your men from the burden of lifting parts to the machines on which they work.

'Budgit' Hoists give you more production at less cost for they permit workers to expend all their energy on profitable work instead of costly lifting. There is more to 'Budgit' lifting than this. Your workers are free from rupture, sprained backs, torn ligaments and you are free from costly compensation to injured men.

Nothing could be simpler, less costly than the installation of a 'Budgit' Hoist. Just hang it up, plug into the nearest electric socket, and use! That's all! The cost of current is small, and maintenance costs negligible due to a 'Budgit' Hoist's efficient design and simple construction.

Test these savings by installing a 'Budgit' Electric Hoist in some spot in your plant where lifting slows up production.

Made in sizes to lift 250, 500, 1,000, 2,000 and 4,000 lbs. Prices start at $119.00. Write for Bulletin No. 371.

'BUDGIT' *Hoists*

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves and 'American' industrial instruments.

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Professor of Industrial Relations, New York University and a Member of the New York Bar

Period Surveyed: January 1 to February 1

Trend Indicators

Wage Hours

PORTAL-TO-PORTAL ACTIVITIES NOT COMPENSABLE UNDER GENERAL OVERTIME CONTRACT

Section 2(a) (1) of the Portal-to-Portal Act, which provides that activities are compensable if there is an express provision to that effect, was held by the court not to mean that a general employment contract providing that overtime shall be paid for all time worked in excess of 40 hours per payroll week makes these activities compensable. In the instant case, plant guards were seeking recovery for a 15-minute period before and a similar period after the regular work day, during which time they were assembled in ranks, inspected, given orders and then marched to their various posts. The court, however, denied the employees payment, since they had no contract covering these periods making such duties compensable, other than a general contract providing for time and a half for overtime. (*In re* Sturtevant *v.* Bethlehem Steel Co., USDC Mass.)

ACTION BARRED BY STATUTE OF LIMITATIONS

The statute of limitations of the Portal-to-Portal Act bars action on a petition to recover unpaid overtime compensation for services rendered prior to the Act, where the action was not commenced within 2 years after it accrued or within 120 days after enactment of the Act. (Marino *v.* Rudolph Knitting Mills, N.Y. Sup. Ct., Spec. Term, Part 1, Kings County)

ACTIVITIES NOT COMPENSABLE

The Federal District Court refused to consider a petition for overtime pay for portal-to-portal activities where the petition did not show that the activities were compensable by contract or custom, since the court is without jurisdiction of an action begun prior to the enactment of the Act. (*In re* Ebenhart *v.* Pipe Machinery Co., USDC N. Ohio)

WAGE INCREASE DENIED

Under a contract wage reopening clause, an arbitrator denied a wage increase even though a 2 per cent rise in living costs and a general increase in man-hour output would justify a small increase, due to the fact that a recent decline in demand for textile products, accompanied by a substantial increase in inventories and a fall in prices makes a risk of granting an increase at the present time too much. (*In re* arb. bet. Fall River Textile Mfrs. Assn. and Textile Workers Union of America)

HELD EXEMPT

An office manager at the office and plant of an employer was held to be exempt from the provisions of the Fair Labor Standards Act when the facts disclosed he customarily and regularly directed the work of 20 employees, with authority to hire or fire all office employees, customarily and regularly exercised discretionary powers, not only in the hiring and firing of office employees but also in distributing work, establishing working schedules, scheduling overtime, and preparing business reports. Furthermore, the office manager performed no work of a nature similar to that performed by the employees under his direction who were non-exempt employees. (Johnson *v.* Hoffman Co., USDC N. Illinois)

EMPLOYEES NOT ENTITLED TO PREMIUM

The contract in the instant case schedules a regular workday of 7:30 a.m. to 4 p.m., permits rescheduling by employer, and provides that employees shall receive a premium of time and one-half for work between 4 p.m. and 7:30 a.m., "except as otherwise provided." Where employees were rescheduled from their regular workday to hours of 6 a.m. to 2:30 p.m., they were not entitled to time and one-half for the period between 6 a.m. and 7:30 a.m., since the contract only obligates the company to pay premium rates during the scheduled rest hours, whatever those hours may be in any 24-hour day, and not during hours which are regularly scheduled work hours. In upholding the company's contention, the arbitrator said: "In interpreting a labor contract, a necessary implication, requisite to carry the intention of the parties into effect, is as much a part of the contract as though it were plainly expressed therein. This means that in the process of deciding the meaning of an

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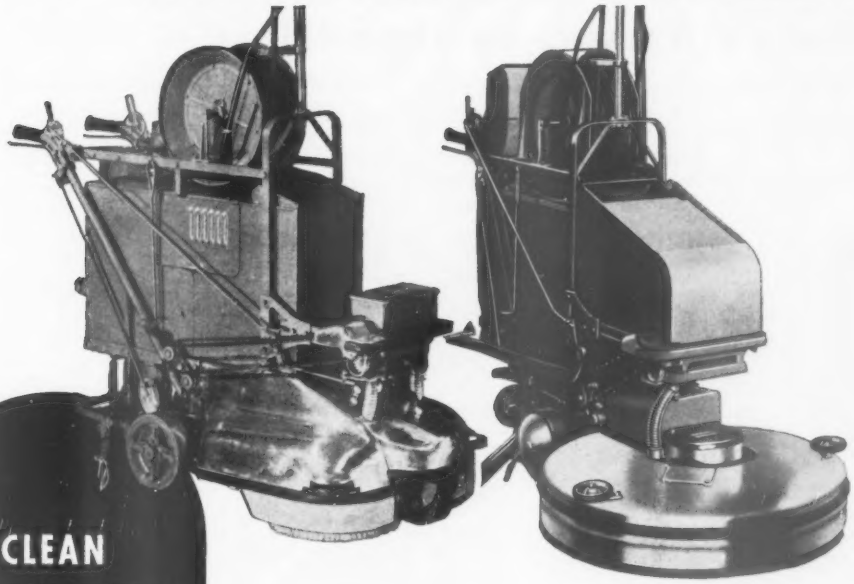

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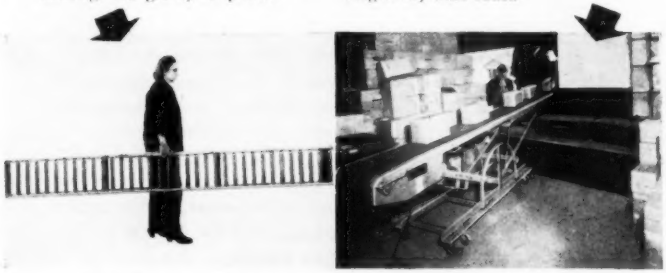

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LABOR DEVELOPMENTS *(continued)*

ambiguous contract, an arbitrator may supply whatever may fairly be implied from its terms." (*In re* arb. bet. Pennsylvania Salt Mfg. Co. and United Mine Workers of America)

Labor-Management Relations

DISCHARGE OF UNION STEWARD HELD UNJUSTIFIED

The discharge of a union steward for refusing a transfer from incentive to non-incentive production was held unjustified, since the record revealed that the employer had not in the past discharged any other employee for failing to accept such an assignment. While the arbitrator held that the failure of the company to discipline others who had refused assignments constitutes no waiver of the managerial prerogative to direct operations and assign its personnel, he found that the pattern of relations between the employer and the employees, indicated by the company's treatment of others, suggests a somewhat discriminatory attitude toward the shop steward. In commenting on the purpose of a labor contract, the arbitrator said: "It is the function of the collective bargaining agreement to stabilize employment relations and to prescribe the standard and procedure for the processing and resolution of grievances. If the Company and the union cannot rely on its respective first-line representatives to negotiate with each other on grievances in a spirit of give and take, as well as in an atmosphere of mutual respect, the function of the collective agreement is rendered impotent, and instability becomes the order of the day." (*In re* arb. bet. Victor Industries Corp. and United Automobile, Aircraft, & Agricultural Implement Workers of America)

*TRANSFER TO LOWER PAYING JOB UNJUSTIFIED

The transfer of an employee to a lower paying job as a penalty for violation of a plant rule against misuse of confidential information, in addition to a 2-week layoff, was held unjustified in view of the employee's long service record and her admitted capability and experience. In holding that the imposition of a double penalty was too severe, the arbitrator pointed out that it is an arbitrator's function to determine whether a penalty is fair and not disproportioned to the offense. (*In re* arb. bet. Gardner-Richardson Co. and United Paperworkers of America)

*RIGHT TO ASSIGN WORKERS LIMITED

An employer was not permitted to assign operators in one classification

*In this classification, items marked with an asterisk also are considered to be trend indicators.

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LABOR DEVELOPMENTS *(continued)*

to relieve employees in another classification during the latter's lunch and rest periods. The employer claimed that the operators had considerable standby time. The contract in the instant case provided that employees in one classification may not be assigned to perform work in another classification except upon reduction or suspension of an employee's work in his own classification or under unusual circumstances. While it is fundamental that management has the right to determine what work shall be done by an employee, these rights may be limited by law or surrendered in the agreement. "In this arbitration, the agreement including the general reservation of powers as well as the specific surrender of certain of those rights, must be construed so as to give effect to all provisions thereof, if that be possible. This requires that meaning be given to the specific limitation as well as to the general reservation." (*In re* arb. bet. Kellogg Co. and American Federation of Grain Millers)

*EMPLOYER HELD GUILTY OF INTERFERENCE

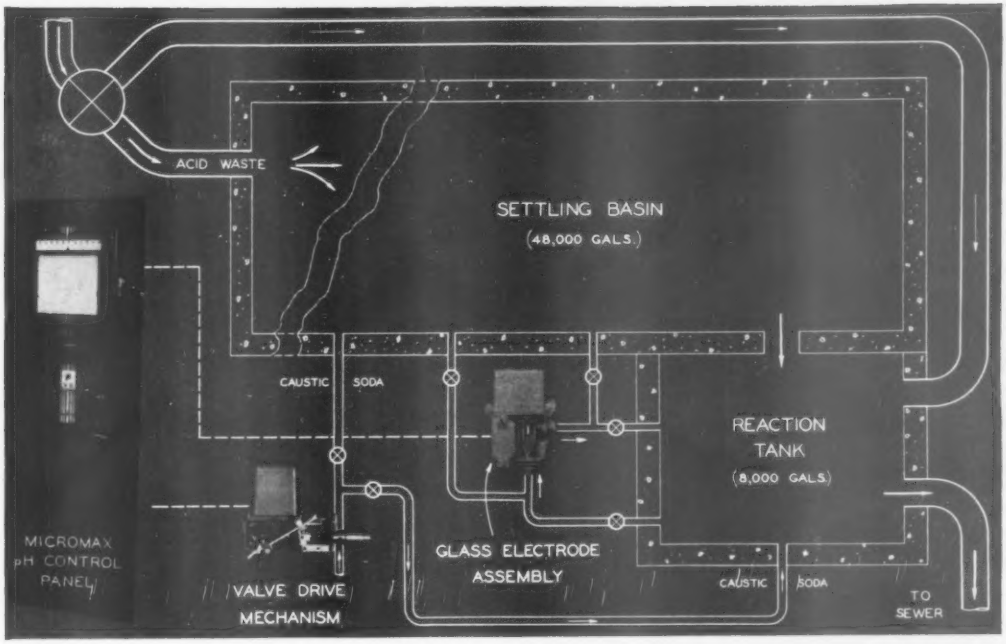
An employer was held guilty of interference where he failed to properly protect an active union member after he was assaulted by anti-union employees in the plant courtroom. The Board found that not only was the employee assaulted in the presence of one of the employer's supervisors, but that the assistant superintendent by advising such union employee that he had better quit because the assault might be repeated, adapted and approved the anti-union employees' conduct. (Fort Worth Transit Co. and Amalgamated Association of Street, Electric Railway, & Motor Coach Employees)

EMPLOYEE UNJUSTIFIABLY LAID OFF

Under a contract requiring that in slack periods work shall be spread and shared equally among employees insofar as possible, an employee was unjustifiably laid off for lack of work where work was admittedly available in his classification and he was omitted from assignments to it. The employer cannot at the arbitration hearing claim that the employee was laid off for the character of his work or personal habits, since at the time of the layoff, the employee was told the cause was "lack of work." (*In re* arb. bet. Apponaug Co. and the Friendly Society of Engravers & Sketchmakers)

*EMPLOYER PERMITTED TO TELL STRIKERS TO RETURN TO WORK OR GET OUT

An employer was justified in instructing five employees who participated in a work stoppage protesting their working conditions to return to work or get out of the department.



Schematic plan diagram of Micromax Automatic pH Control as applied to acid waste in Western Electric Co.'s new "controlled conditions" plant at Allentown, Pa. Waste is from metal-finishing and -plating operations.

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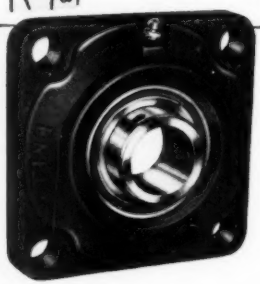

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LABOR DEVELOPMENTS *(continued)*

Such an action on the part of management does not constitute discriminatory discharge, since an employer has the right to demand of employees that they resume work or leave the plant. In its decision, the Board pointed out that the alternative offered by the employer was "to return to work or leave the plant" and not "to return to work or be discharged." (*In re* Electric Auto-Lite Co. and United Automobile, Aircraft, & Agricultural Implement Workers of America, NLRB)

***DISCHARGE OF EMPLOYEES WHO REFUSED TO WORK OVERTIME JUSTIFIED**

An employer was justified in discharging five active union members who refused to obey an order to work overtime, in order to attend a union meeting which was previously scheduled for the same time. The Board could not find that management's order of overtime work was a discriminatory move, since it was not issued with the intent to prevent the employee from attending the meeting. (*In re* Super-Cold Southwest Co. and Retail, Wholesale, & Department Store Union, NLRB)

***EMPLOYER NOT REQUIRED TO HIRE ECONOMIC STRIKERS**

A mass application for reemployment by economic strikers who had been replaced does not obligate the employer to seek out the applicants when jobs are available, in the absence of a clear understanding that the application was a continuing one. The facts of the case were that the economic strikers made a mass application for reemployment on March 12, 1946, but were not hired because they had been replaced. By July 12, 1946, the employer had hired 77 persons without employing a single striker. Since none of the strikers made any application for employment during the period mentioned, there was no basis for an inference of discrimination, according to the court. The Board's finding that the mass application was a continuing one was overruled as unsupported by evidence. Said the court: "To say that one mass application for employment at a time when all the jobs were filled was a continuing application so as to relieve the employees of making further applications or of informing the petitioner that they desired work, is to relieve the strikers of their duty to apply when a job was available, and to shift the burden to the employer of seeking out one of the strikers to fill the jobs or be guilty of discrimination." (Sax *v.* NLRB, CCA 7)

***PROMOTION PROPERLY DENIED**

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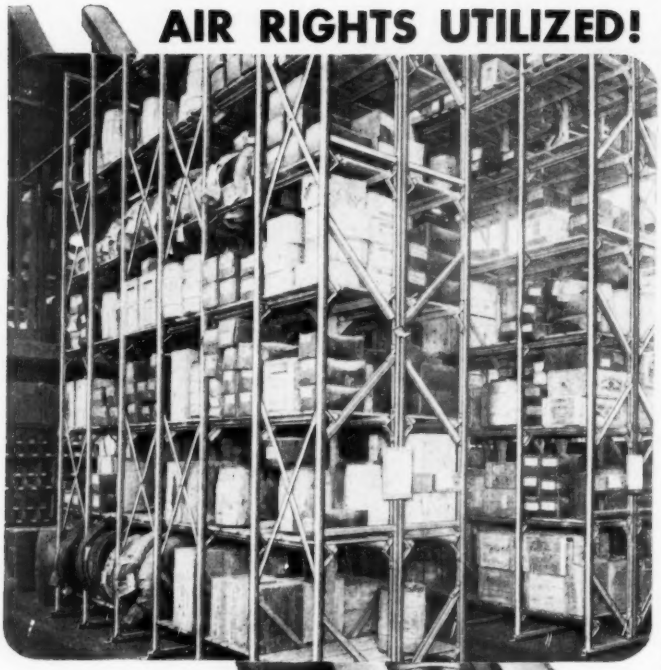

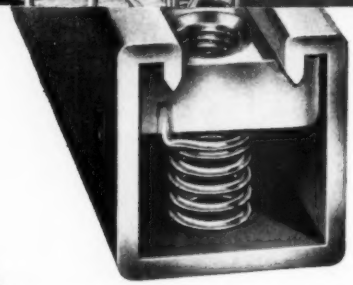

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LABOR DEVELOPMENTS *(continued)*

senior employee on the ground that the employee did not yet meet standards for more complex phases of the job. In upholding the company's action, the arbitrator pointed out that the company's standards do bear a reasonable relationship to the content of the job. While the arbitrator conceded that the standards may appear too high as far as the routine tasks are concerned, he further added that the standards in this situation must be designed to cope with the "peak load" of the job content, not the average or usual load. (*In re* arb. bet. California Electric Power Co. and International Brotherhood of Electrical Workers)

***INCREASE IN WAGES IMPROPERLY DENIED**

An employer improperly denied an increase to piece workers to bring their rates in line with those paid other craft employees in the plant, on the ground that they have deliberately restricted production and are therefore not entitled to an increase. The company's contention was rejected by the arbitrator, who found that restriction of production had been going on for years without the company's having taken any steps to stop it. (*In re* arb. bet. Hamilton Shoe Co. and Boot & Shoe Workers Union)

***EMPLOYEE ON SICK LEAVE ENTITLED TO HOLIDAY PAY**

Where the contract conditions the granting of holiday pay upon the fact that the employee was present on the day before and after the holiday, unless absent with reasonable cause, an employee who was on sick leave during the week when the holiday occurred is entitled to pay for such day. Such an absence because of illness was held by the arbitrator not to be "without reasonable cause" and therefore may not be used to deprive the employee of holiday pay. In the instant case, the employee was on an inactive payroll receiving sick benefits during the holiday week. While the arbitrator found it difficult to see why an employee should be compensated for a holiday which occurred during a period when she did not work and was not expected to work, he said: "This is a case where the unambiguous wording of the contract clause must take precedence over a personal evaluation of the equities of the situation." (*In re* arb. bet. Eastern Tool & Mfg. Co. and Independent Tool, Plating, & Wire Forming Workers' Union)

PRIOR INTERPRETATION GOVERNS ARBITRATION

Where an arbitration board is deciding a question of contract interpretation which is identical to a question they have previously ruled upon, the prior interpretation should

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LABOR DEVELOPMENTS *(continued)*

control unless evidence is presented which is "newly available," "newly discovered," or "of exceptional probative value," causing the original decision to be erroneous. (*In re* arb. bet. American Steel & Wire Co. and United Steelworkers of America)

***ARBITRATION NOT REQUIRED**

While an employer is not required to arbitrate a dispute over the proper rate for a job established after the agreement was executed where the contract limits arbitration to disputes over the meaning and application of contract terms, he was held obligated to negotiate rates for job classifications established after the effective date of the contract. The arbitrator pointed out that it is a well-established principle of law that an employer is obligated to bargain with the representative of his employees on matters involving wages, hours, and working conditions. "The mere fact that a new contract has been entered into, after which the new job is established, does not alter the employer's obligation to continue the bargaining function during the life of said contract." (*In re* arb. bet. Bliss & Laughlin, Inc. and United Steelworkers of America)

***REPORT PAY DUE**

Report pay was due employees who reported for work on the midnight shift and found no work available because the equipment, which was damaged by an electrical storm occurring about six hours earlier, had not been repaired because of an inadequate amount of linemen and the fact that testing material was not readily available. Although the contract provided that report time was not due in the event of the "acts of God which interfere with work being provided," the arbitrator ruled that "There is a point, after the occurrence of a breakdown or act of God, when management has—or reasonably should have—regained control of the situation. When that point is reached—when management has had an adequate opportunity under the circumstances to assess the damage and make a reasonably accurate estimate of the time it will take to make repairs—management again falls under the obligation of the Reporting Allowance Section." (*In re* arb. bet. National Tube Co. and United Steelworkers of America)

***UNION MEETINGS BANNED ON COMPANY PROPERTY**

Where the contract banned union activities on company property without the employer's consent, union stewards were not permitted to hold a meeting in the plant protesting the employer's plan to subcontract some work, even though the employer

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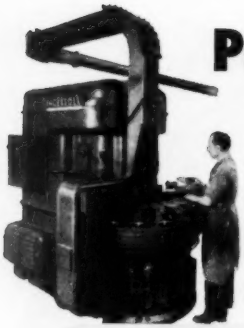

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STOP THE DUST HOG
from stealing profits with

Pangborn

DUST CONTROL

LABOR DEVELOPMENTS *(continued)*

allowed such meetings in the past and only outlawed membership solicitation. The arbitrator rejected the union's contention that the holding of a meeting on company property was in accordance with custom and practice and held that under the contract a union meeting on company property without the consent of the company constituted a violation of the contract. (*In re* arb. bet. Fox Co. and Metal Polishers, Buffers, Platers, & Helpers International Union)

*CHECKOFF-OBLIGATION TO NOTIFY UNION OF REVOCATION

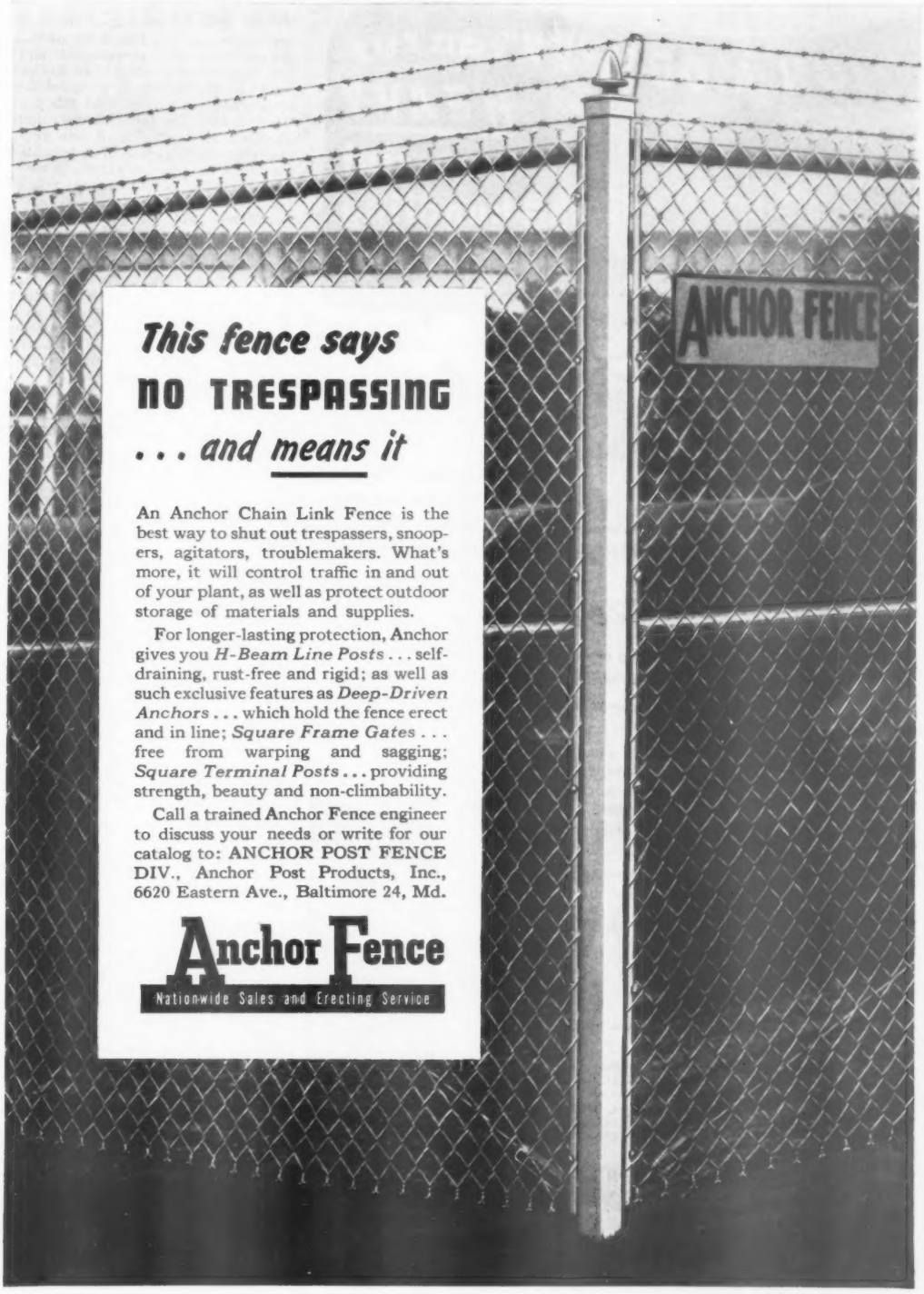
Where the contract provides that if an employee wishes to revoke his checkoff authorization he "should" notify the union at the same time, an employer was justified in discontinuing dues deductions upon receipt of the proper notice, despite the fact that the employees failed to notify the union. The union contended that under the contract the company had no right to stop checking off the dues of any employee until the union had received cancellation notice similar to that received by the company. The arbitrator rejected the union's contention and concluded that the intent of the word "should" instead of "shall" in the checkoff clause of the contract was to place a moral rather than a mandatory obligation on the employee desiring to cancel his checkoff authorization, and was not to make a similar notice to the union necessary before the company could act on the cancellation. (*In re* arb. bet. Margate Hosiery Mills Co. and Textile Workers Union of America and American Federation of Hosiery Workers)

*WELFARE FUND HELD VALID

The provision of the Taft-Hartley Act exempting welfare funds established prior to January 1, 1946, from the administrative requirements of the law was interpreted by the New York Supreme Court to mean that if the purpose of such welfare funds complies with the present law, unilateral union administration of the fund is valid. The court held that an employer may make contributions to a union trust fund in accordance with his contract, even though the contract was executed after the enactment of the law, since the fund was established prior to January 1, 1946, and by that time other employers were making payment into the fund. (*In re* Baker-Wholesale & Warehouse Workers' Union, N.Y. Sup. Ct., Special Term, Part 1, New York County)

*CONTRACT HELD NO BAR TO REPRESENTATION PROCEEDING

Where a contract failed to include any provision with respect to its duration or termination, it was held



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LABOR DEVELOPMENTS *(continued)*

no bar to a representation proceeding. Although the Board found that the omission of a termination date left considerable doubt as to the intent of the parties, it accepted the employer's contention that the parties intended the contract to remain in effect for a period of one year, and that the omission of a termination date was pure oversight, in view of the history of negotiating yearly contracts. Under the circumstances, the Board said, "it was incumbent upon the Intervenor, relying on the contract as a bar, to offer some evidence to substantiate its contention that the contract had not in fact expired in accordance with the intent of the parties and was effective as a bar to this proceeding." (Nassau Utilities Fuel Corp. and Fuel Oil Transportation & Maintenance Employees Assoc., NLRB)

SELECTIVE SERVICE ACT CANNOT BE AVOIDED BY LABOR CONTRACT

The court recently affirmed the principle that the intent of the Selective Training and Service Act cannot be avoided by a contract of employment. Therefore, a veteran was held entitled to reemployment rights where he left a position "other than a temporary position," even though the contract classified the veteran as a temporary employee because he had not worked more than six months, since the evidence indicated that the veteran was employed on what would have been a permanent position except for his induction into the military service. (Meredith *v.* Industrial Rayon Corp., USDC N. Ohio)

VETERAN NOT ENTITLED TO REEMPLOYMENT

A veteran was not entitled to be reemployed by an employer where the evidence showed that while he resigned his position with the employer in Nov., 1942, and shortly thereafter made application for an official position in the navy, he was not called to service until May, 1943, and during the intervening 5 months he was gainfully employed by other employers. The court pointed out that a veteran is only entitled to reemployment rights in a case where he "has left his position in order to perform training and service." In the instant case, however, when the veteran resigned his employment, he was under no compulsion of a call to military or naval service. The court said, "The Act did not contemplate a case where an employee would spend almost six months in other employment before he actually entered upon his country's service and then claim the right of reemployment in his service of an original or former employer." (Loper *v.* Allied Bldg. Credits, Inc. USDC W. Missouri)

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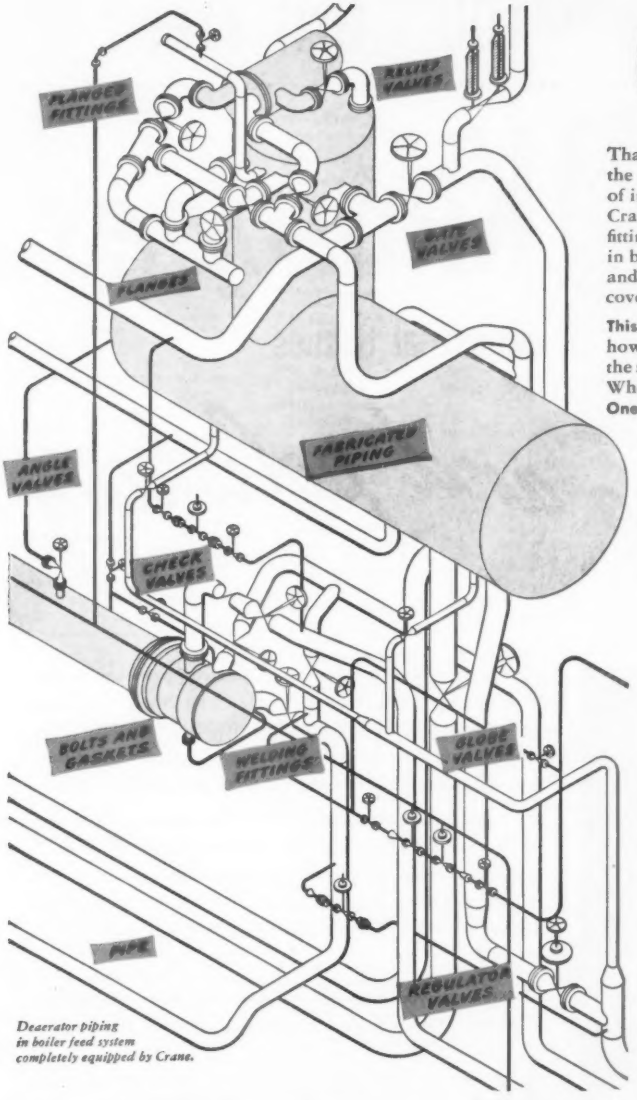

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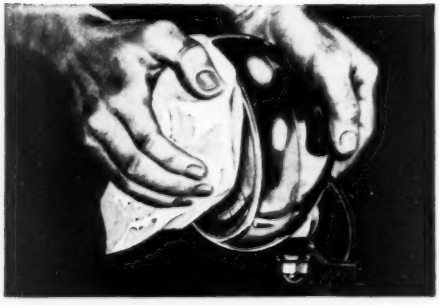

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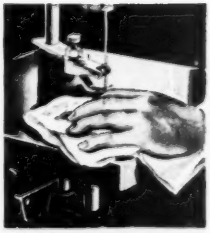

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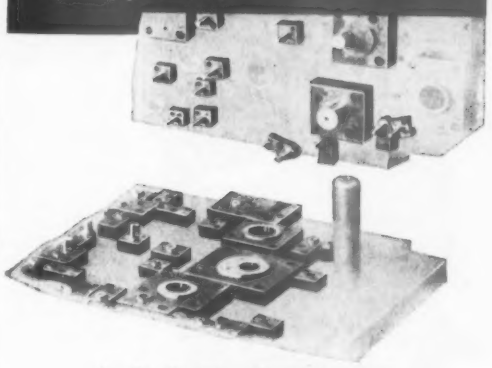

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THEY SAY AND DO

Methods Engineering and Materials Handling

HAROLD B. MAYNARD, President, Methods Engineering Council, Pittsburgh, speaking before the Materials Handling Conference

Modern methods engineering is a technique, or perhaps better, a group of techniques, which is used to find the most effective way of accomplishing any useful task. It employs such tools as process charts, operation analysis, motion study, and time study in its search for better methods of doing work.

Methods engineering seeks to improve handling methods as well as processing methods and hence somewhat overlaps the field of materials handling engineering. There is no real conflict, however. Materials handling engineering develops materials handling methods and devices as the result of intensive study of handling problems. The methods engineer endeavors to see that the methods and devices developed by the materials handling engineer are applied to the work he studies, but if none that is suitable is available, he may then develop his own.

I said at the outset that methods engineering is interested in finding effective ways of accomplishing useful work. Because of the term "useful," the materials handling which is involved in any process is always viewed by the methods engineer with something less than enthusiasm. Materials handling adds to the cost of the product without adding to its value, at least while it is still in the plant, and therefore the methods engineer is firmly convinced that the part which is the least handled is the best handled.

The methods engineer seeks if possible to eliminate materials handling altogether before seeking more effective handling methods. He adopts the questioning attitude, and repeatedly asks why—why is the part being handled? In a gratifyingly large number of cases, the answer is that the handling is not necessary or at least can be reduced considerably if certain changes in layout or methods are made. Thus when faced with a materials handling problem, the methods engineer always seeks first to solve it by eliminating the necessity for materials handling. He improves the layout of the plant, revamps the arrangement of the individual work stations and the like, seeking to reduce handling both between processing operations and during the performance of the processing operations.

If, at length, the handling of materials is found to be necessary, then the methods engineer seeks better and less expensive ways of accomplishing it. Here the interests of the methods engineer converge with the specialized interests of the materials handling engineer. He looks to the materials handling engineer for assistance, and from him receives much valuable help.

It is probably safe to say that in the past the majority of the materials handling studies which have been made by methods engineers have been made within the confines of the industrial organizations which employed them. Here they have accomplished much and have made important contributions to raising the level of American productivity.

But materials handling goes on from the very start of the process until the finished product is in the hands of the ultimate consumer. This means that there are many, many materials handling problems which exist outside the plant, problems which may be more serious in their cost-increasing effect than the internal handling problems. This carries us into the matter of distribution problems and the very live subject of the reduction of distribution costs.

In the field of distribution, materials handling costs are such an important part of distribution costs that intensive study is fully justified. It matters little whether that study be undertaken by a methods engineer or a materials handling engineer. The important point is that someone technically trained in the reduction of handling costs should be working on the problem.

Protect the Patent System

HOWARD E. BLOOD, President, Norge Division, Borg-Warner Corporation, speaking before the 53rd Congress of American Industry

Repeated attempts have been made in recent years to undermine and weaken the American patent system. Compulsory licensing and even the abolition of patents has been recommended in high places. It seems very clear to me that our patent system is one of the things that we should defend and protect. Congress can easily enact the legislation which is necessary to correct the present imperfections of the law and to straighten out the ambiguity and confusion that exists. When this is done the American patent system can continue to be one of the main forces in the continuous improvement of our standard of living.

It is little realized that the American patent system has been one of the most important factors in developing our high standard of living and our American way of life. More widespread public interest in our patent system is important. Ill-

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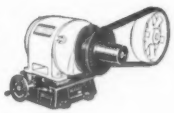

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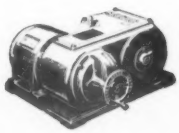

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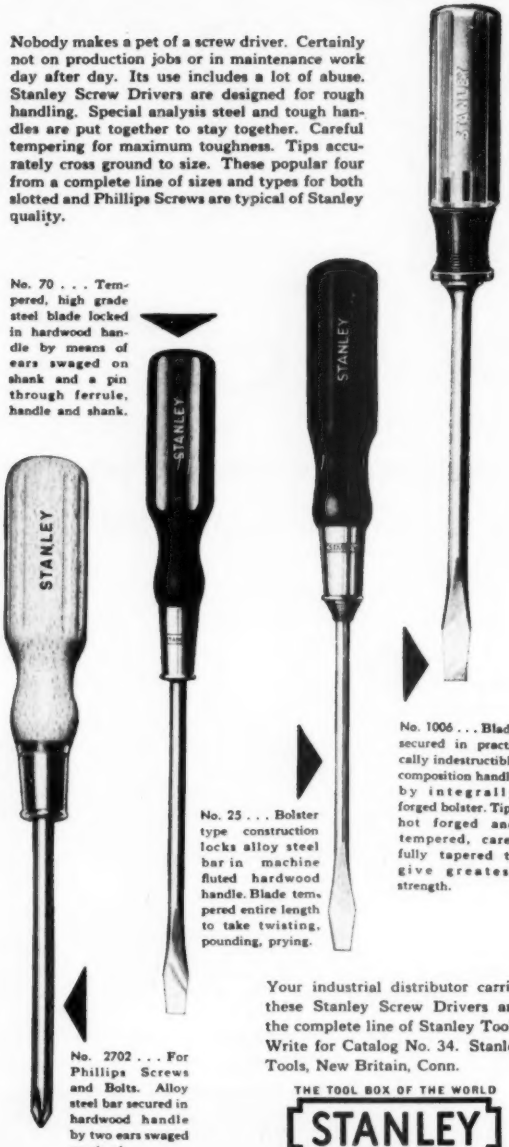

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advised tampering with it would adversely affect our standard of living and the life of every American citizen.

Seminar on the American Way

A series of seminars titled "The Freedom Forum" began February 27, 1949, at Harding College, Searcy, Ark., and will continue one week each month for the next year.

The seminars will stress economic education, factory programs, and the teaching of the American way of life. They will be directed by Dr. George Benson of Harding College, and are being sponsored jointly by Harding College and the Joint Committee of the AAAA and ANA.

Business and industry have been asked to send representatives to attend the course.

Industry's Stake in American Education

HENRY T. HEALD, President, Illinois Institute of Technology, speaking at Clarkson College of Technology, Potsdam, N. Y.

American business needs to reconsider and redefine its responsibilities as a good citizen—it is indeed now a citizen in the broadest concept. If it wishes to preserve the system in which it has followed, its leaders should think seriously about its responsibility to protect and defend freedom in education on the higher levels. When federal support remains as the only bulwark of higher education, American business inevitably will suffer. It will have none but its collective self to blame if the country's system of higher education is permitted to flounder and collapse in the mire of politically dominated state control. If this happens, the American free enterprise system, too, will collapse.

Fundamental Goals of Labor and Management

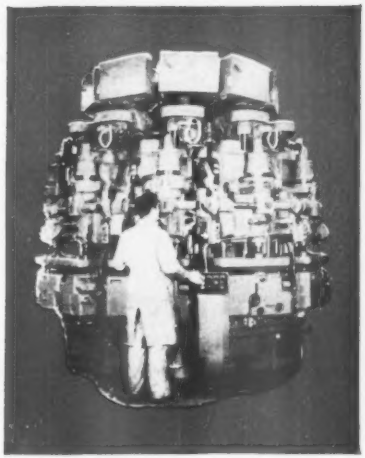
An understanding of labor-management goals is urged in a recent report of the labor committee of the Twentieth Century Fund. The report proclaims that fundamental goals of both labor and management can be reduced to about four on each side.

The fundamental aims of labor are listed as:

A sense of security, both on the job and in the community. The organized worker looks upon the union as his primary safeguard.

An opportunity to advance, a fair chance for promotion, and general betterment.

More human treatment, including being consulted about



"One costly shutdown after another dogged our machine shop operations until we finally learned the reason. Our circulating oils were foaming and oxidizing which caused sludge formation and critical corrosion damage to our equipment.

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things that vitally affect labor's welfare.

A sense of dignity on the job, a feeling of doing useful, constructive work.

The fundamental goals of management are presented as:

Good business for the company, and its general economic health.

Good relations with its own employees, to gain their loyalty and keep them satisfied with working conditions.

Freedom to manage, without interference from unions or employees.

Businesslike relationships and more responsibility on the part of employees and unions, so that the company will have assurance that contracts and agreements will be carried out.

BEHIND THE BYLINE

Facts About *Factory's* Authors

Peter J. Eytalis (page 76) went to work in the farm implement industry at the age of 15. During the next four years, he worked in various industries in Chicago learning tool and die making. When he was 19, he was assistant supervisor in a tractor works, where he remained for four years. In 1929 he became associated with his father's business of manufacturing and selling shoe repair machinery, and in 1935 he joined the Mechanics Universal Joint Division of Borg-Warner, where he is now in charge of all hydraulic, lubrication, and experimental work.

C. E. Cass (page 80) had a background of eighteen years in the production end of manufacturing and publishing before he joined Marathon Corporation in 1942. His first job with Marathon was coordinating an expansion program for the company's Menasha, Wis., division. Later he worked on the layout and construction of their new carton plant, com-

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BEHIND THE BYLINE *(continued)*

pleted in 1947. His present position involves responsibility for layout programs in the five plants comprising Marathon U.S. Operations. He is an associate member of the Technical Association of the Pulp and Paper Industry.

Clyde O. Ingram (page 82), co-author of the article "Anti-Leak Drive Stops Waste," has been with the B. F. Goodrich Company for over 40 years. He has held the position of power engineer for the past 20 years.

William P. Sheehy, co-author of the "Anti-Leak Drive" article on page 82, has been maintenance engineer at the B. F. Goodrich Company for 20 years. He is another oldtimer there, having been affiliated with the firm for over 40 years.

F. W. Stein (page 92) joined the Standard Register Company in Dayton, Ohio, in 1934. His first job there was that of plant superintendent. His previous work with Nash Motors and Fairbanks-Morse had given him a background in industrial management. He was made vice president in charge of manufacturing at Standard Register in 1942.

Arthur R. Cannon (page 95) is president of Oliver B. Cannon & Son, Inc., a Philadelphia firm specializing in industrial painting. His father had started the business doing local

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BEHIND THE BYLINE *(continued)*

general contract work, but when the son became a partner he decided to concentrate on factory contracts, which present a multitude of varying technical problems that keep the work always interesting. He spent some time in the merchant marine as a radio operator, later studied at MIT.

Zeno Neri (page 110) was born in Castelnuovo Val di Cecina, a town near Pisa, in Italy, but left at the age of ten to join his father at Masontown, Pa. A graduate of West Virginia University, he was assigned to capacitor development engineering after he joined Westinghouse, and became a specialist in calculating capacitor transient phenomena.

William G. Guthrie (page 116), works manager for Allison Division, General Motors Corporation, was born in Paterson, N. J. He joined General Motors in 1912. He was chief of standards and process methods for Buick until 1920, then became assistant to the president of Oldsmobile. In 1930 he was appointed regional production manager for GM's European activities, and during the next ten years was works manager for the GM Opel Plant in Germany and assistant general manager and director of the GM Vauxhall Plant in England. He returned to this country in 1939 to take up his present duties at Allison.

W. A. Dakan (page 118) has been with Nebraska Salesbook Company for thirteen years, during which time he has developed an industrial engineering department, a standard cost system, and a production control system. During the war he taught special training courses in industrial management at the University of Nebraska, of which he is a graduate.

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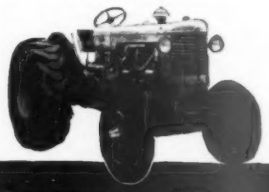

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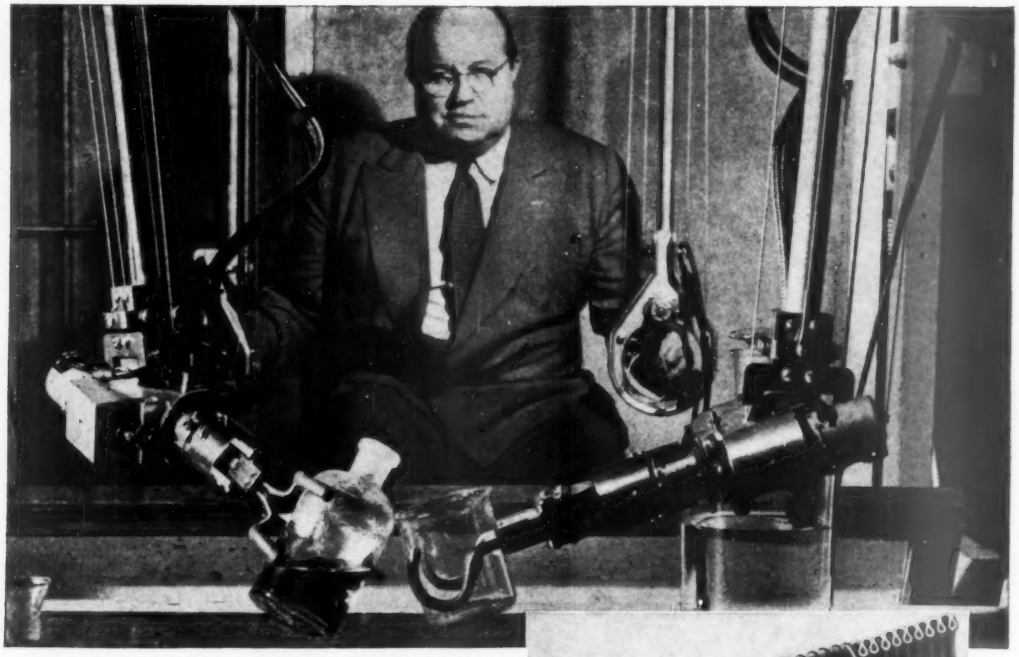

Inventor, John Payne, operates the amazing mechanical hands that he and other General Electric scientists, engineers and craftsmen built for the Atomic Energy Commission. It is operated through a thick wall, the manipulation being guided with the help of mirrors.

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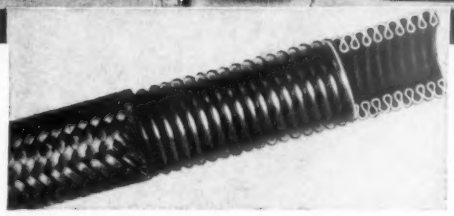

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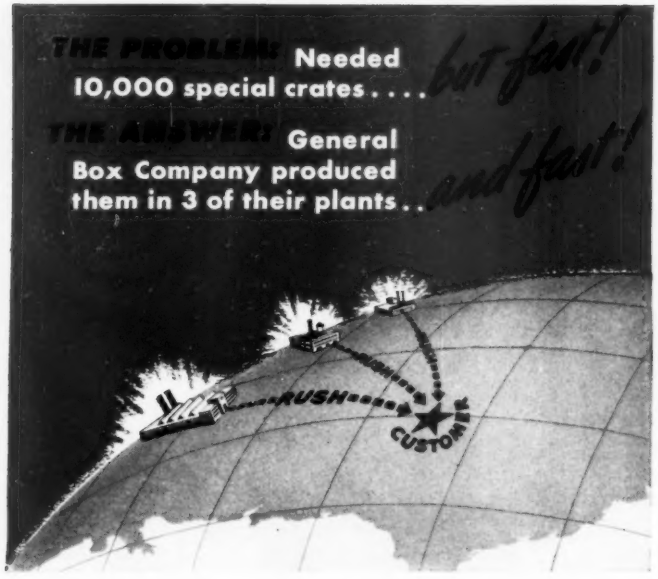
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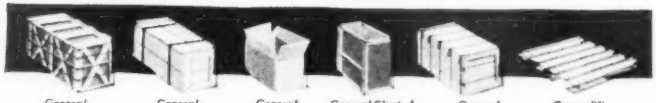

BOOKS

Standard Handbook for Electrical Engineers

ARCHER E. KNOWLTON, editor-in-chief, and **R. M. SHOOP** assistant editor. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. 8th edition. 2311 pages. Diagrams, sketches, maps, charts, graphs, tables, formulas, index. $12.

Specialists in 20 different fields of electrical engineering have prepared the material in this book, which is tabularly divided into 26 sections. The recognized standards have been used wherever possible, usually those recommended by the national societies or organizations in the field.

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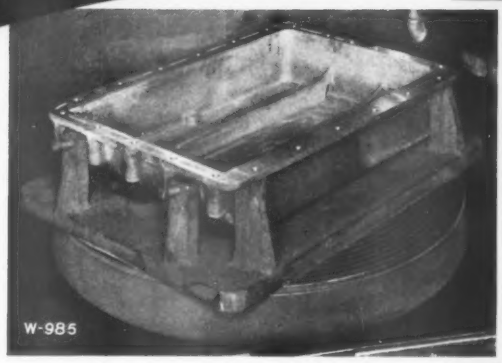

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Subtitled "Principles, Practices, and Point of View," this revised edition brings up to date material on personnel tools and records, the use of psychology in personnel administration, education, and training, employee incentives, special problems in personnel administration and management, and employee representation and social controls. Much of the new material was obtained as the result of a survey of 325 leading companies, discussed in one of the appendixes.

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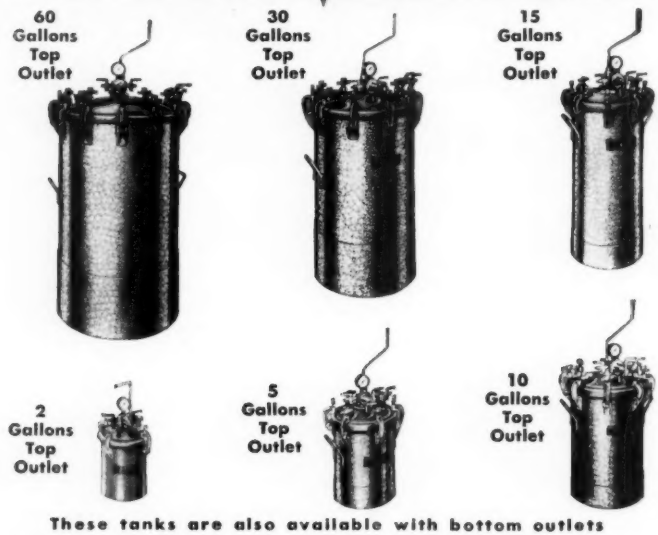
Cadmium plated pressed steel removable lids are held securely by "C" type clamps. Top or bottom outlets. Hand or motor-driven agitators. All Binks material tanks meet A.S.M.E. specifications.

Let us have your order right away

If you do not have a Binks catalog available we will be glad to give you complete information and prices on any type or size of tank by mail or phone. Orders will be filled in the order in which they are received.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30 Gallons Top Outlet
15 Gallons Top Outlet
2 Gallons Top Outlet
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authors, subjects. $2 in the U.S.A.; $2.50 elsewhere.

This book contains abstracts of 82 papers selected for awards in the "Design-for-Progress" Award Program. The book itself has been prepared with the purpose of making available a record of representative welded designs in various fields. The material is divided into sections covering aircraft, automotive, railroad, watercraft, containers, furniture, structures, and machineries.

Dictionary of Industrial Engineering Words, Terms, and Phrases

Industrial Engineering College, 3309 Washington Blvd., Chicago 24. 74 pages. $2.

This is a looseleaf book, so bound in order that supplements may be added from time to time. It contains over 500 words, terms, and phrases, and many abbreviations used by the profession.

Management Survey

F. C. HOOPER, BSc., F.I.I.A. Pitman Publishing Co., 2 W. 45th St., New York 18. 176 pages. Index. $2.75.

One of the "Higher Studies in Commerce" series, subtitled, "The Significance of Management in the Modern Community." It is written to give the layman and the beginner in business a broad picture of various aspects of management.

Conference Leaders Manual

National Metal Trades Assn., 122 S. Michigan Ave., Chicago 3. 159 pages. Tables, layout diagrams, specimen conference plans, appendix. $7.50.

This book is a companion to *Foremanship—A Practical Guide*, described above. It follows up the factual material presented there with a discussion of successful methods. It covers general information for the leader and includes conference outlines, with a subject index and an index of advanced foremanship subjects.

The School Custodian's Housekeeping Handbook

HENRY H. LINN, Professor of Education, Teachers College, Columbia University, **LESLIE C. HELM,** Superintendent of Engineering Service, Teachers College, Columbia University; and **K. P. GRABARKIEWICZ,** Supervisor of Maintenance, Montgomery County Public Schools, Maryland. Bureau of Publications, Teachers College, Columbia University, 525 West 120th St., New York 27. 296 pages. Photographs, tables, sample forms, diagrams. $3.75.

Although this book is directed at school custodians, there are many

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Any insulation will save *some* money. But only the right insulation, specifically engineered for a specific job, will save the most money for the longest time.

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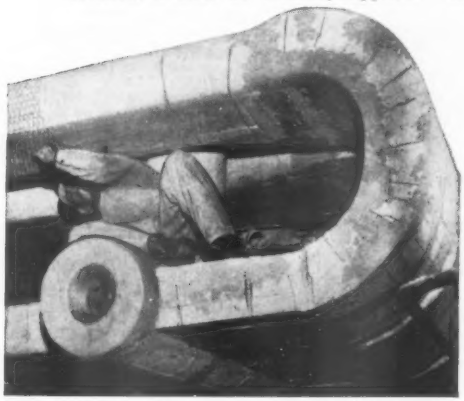

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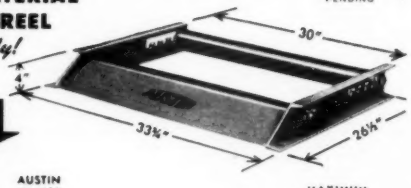

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Source Book of Personnel Forms

LAWRENCE STESSIN, labor relations staff, National Foremen's Institute Inc., Deep River, Conn. 176 pages. Specimen forms. $7.50.

Subtitled "A Manual for Improving Personnel Administration." A presentation of 170 different forms gleaned from a survey of forms used by more than 1500 companies, illustrated and analyzed under 33 different categories. They are bound in a loose-leaf multi-ring binder so that additional material may be inserted as it appears.

BOOKLETS

THE WHY OF WORK. The Economic Facts of Life series. Merle D. Schmid, President, Society for Advancement of Management, Chicago. Industrial Management Engineers 111 West Jackson Blvd., Chicago 4. 20 pages. Poster-type charts. 60¢.

1949 DIRECTORY OF OCCUPATIONAL SAFETY POSTERS. National Safety Council, 20 North Wacker Drive, Chicago 6. 72 pages. 74 illustrations of 2-, 3-, and 4-color posters, classified under 15 sections, index of specific accident hazards. 50¢.

BETTER RELATIONS THROUGH BETTER UNDERSTANDING. Edited by E. Clark Worman. Proceedings of the 1948 Silver Bay Conference on Human Relations in Industry. Association Press, Industrial Services, National Council, Y.M.C.A., 347 Madison Ave., New York 17. 144 pages. Photographs. Single copies, $1.50; 12 for $15.

A DYNAMIC EQUIPMENT POLICY FOR AMERICA (An Excerpt). George Terborgh. Machinery and Allied Products Institute, 120 South LaSalle St., Chicago 3. 25 pages. Single copies, 25¢; lower prices for quantity orders.

CASE STUDIES NO. 3, CAUSES OF INDUSTRIAL PEACE UNDER COLLECTIVE BARGAINING. Dewey & Almy Chemical Co. and the International Chemical Workers Union. Douglas McGregor, president

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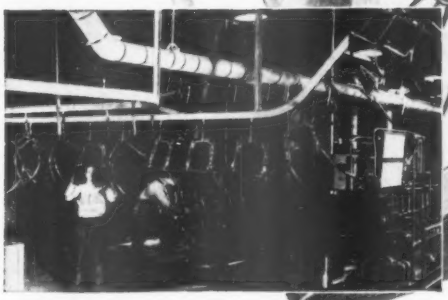

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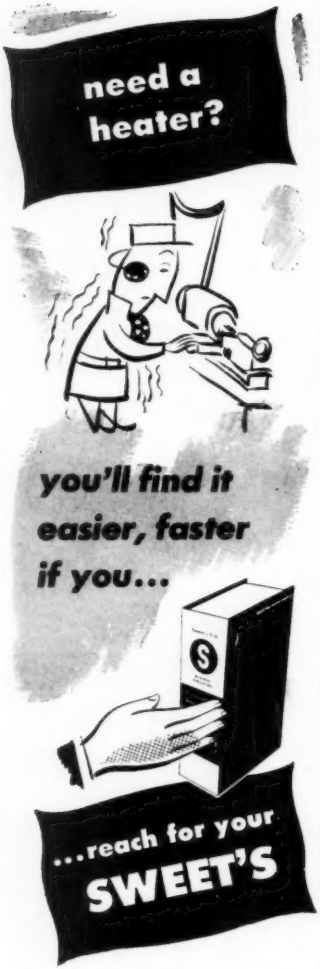

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of Antioch College, and Joseph N. Scanlon, industrial relations section, Massachusetts Institute of Technology. National Plannng Association, 800 21st St., N. W., Washington 6, D. C. 88 pages. Tables, appendixes A through F. $1.

WHAT FACTS NEED FACING IN INDUSTRIAL RELATIONS. Management Report No. 17. John P. Troxell, director, Division of Industrial Relations, Stanford University. Research Div., California Personnel Management Assn., 870 Market St., San Francisco 2. 10 pages. Photograph. $1.

BUSINESS ESTABLISHMENTS, EMPLOYMENT, AND TAXABLE PAYROLLS. Series of 51 surveys, with separate reports for each state, the District of Columbia, Hawaii, and Alaska, sponsored by the Office of Domestic Commerce, Department of Commerce, and the Bureau of Old-Age and Survivors Insurance of the Social Security Administration. U.S. Government Printing Office, Washington, D. C. 1000 pages. County-by-county employment and payroll data for 2.5-million business establishments, grouped under 157 industrial headings, tables, charts. 5¢ to 25¢ each for individual reports, according to state; complete set, $7.

HANDBOOK OF "U" (Insulation) VALUES. Silvercote Products, Inc., 161 E. Erie St., Chicago 11. 108 pages. Tables, cross-section diagrams. $1 (no charge to qualified personnel in fields of architecture, engineering, building).

INFORMATION SOURCES FOR SMALL BUSINESS. James C. Yocum and Emma Ferrin. Ohio Small Business Handbook No. B-3, 2nd edition. Bureau of Business Research, College of Commerce and Administration, The Ohio State University, Columbus, Ohio. 94 pages. Sketches, bibliography. 50¢.

EXECUTIVE PERSONALITY AND JOB SUCCESS. Personnel Series No. 120. American Management Association, 330 West 42nd St., New York 18. 35 pages. 75¢.

PERSONNEL FUNCTIONS AND THE LINE ORGANIZATION. Personnel Series No. 121. American Management Association, 330 West 42nd St., New York 18. 31 pages. 75¢.

OPERATING UNDER THE LMRA; REGULATION OF WAGES TO PRODUCTIVITY. Personnel Series No. 122. American Management Association, 330 West 42nd St., New York 18. 63 pages. $1.25

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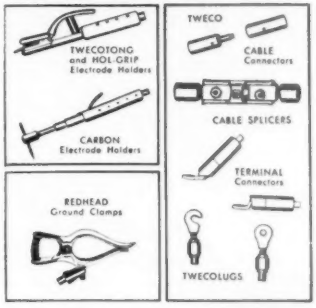

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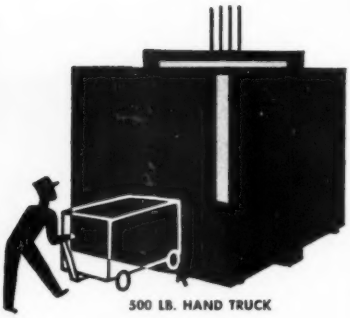
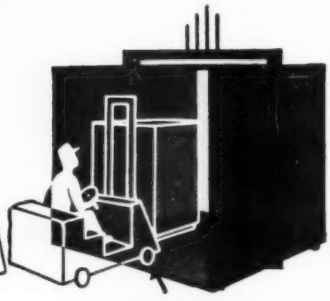


500 LB. HAND TRUCK



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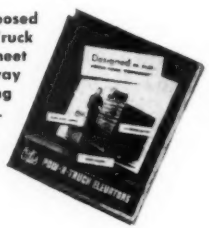

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YOUR GUIDE TO SAFETY IN WELDING AND CUTTING OPERATIONS. Association of Casualty & Surety Companies, 60 John St., New York 7. 34 pages. Sketches, chart. Available through member companies of the association.

THE DEVELOPMENT OF A NEW GREASE, *Lubrication*, Vol. XXXIV, No. 12, The Texas Co., 135 East 42nd St., New York 17. 12 pages. Photographs, drawings, figures, chart. No charge.

LEGISLATIVE REPORT — STATE LAWS REGULATING LABOR UNIONS. Supplement No. 2. U. S. Dept. of Labor, Bureau of Labor Standards, Washington, D C. 36 pages. Tables. No charge.

ANALYSIS OF REPORTED ACCIDENTS ON PASSENGER AND FREIGHT ELEVATORS AND MOVING STAIRWAYS IN U.S.A., 1947. Information Bulletin B-2068, 8490. The Otis Elevator Co., 260 Eleventh Ave., New York 1. 12 pages. Tables. No charge.

CAPITAL FORMATION UNDER FREE ENTERPRISE. National Association of Manufacturers, 14 West 46th St., New York 20. 88 pages. No charge.

A CODE OF MANAGEMENT PRACTICE RELATING TO THE STATUS OF THE FOREMAN, being the Suggestions Arising From the Work of a Management Study Group. Institute of Industrial Supervisors and Industrial Administration Group of the Students' Union of the Birmingham Central Technical College. Industrial Administration Group, Birmingham Central Technical College, Suffolk St., Birmingham, England. 19 pages. £2.

A PROGRAM FOR COMMUNITY ANTI-COMMUNIST ACTION. Chamber of Commerce of the U. S., Washington 6, D. C. 56 pages. Tables; bibliography; appendices; A, B, C. Single copies, 50¢; lower prices for quantity orders.

PUBLIC HEALTH REPORTS, Vol. 63, No. 46; Industrial Sickness Absenteeism. W. M. Gafafer, Principal Statistician, Public Health Service. 9 pages. Tables, charts. 10¢

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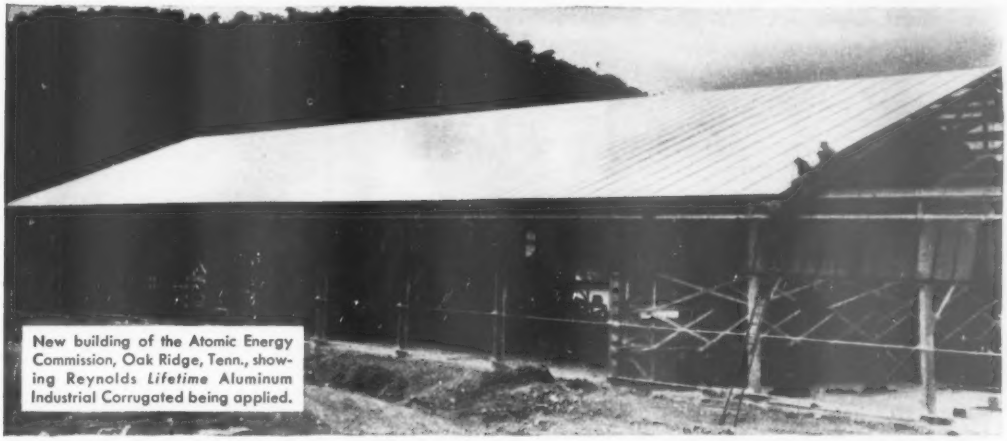

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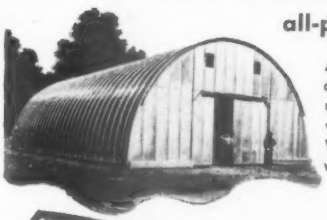

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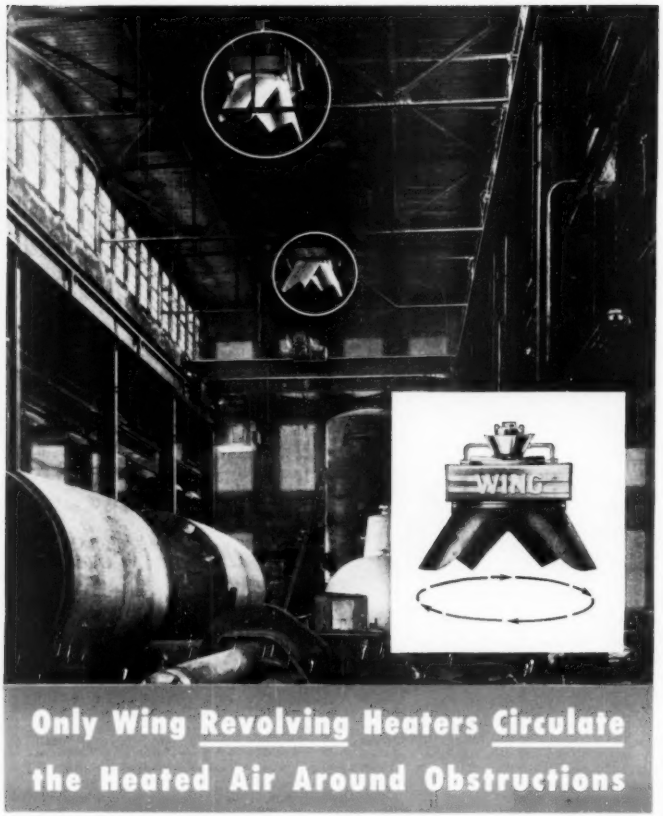

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Commerce. University of Pennsylvania Press, Philadelphia. 51 pages. Tables. $1.

CASE STUDIES NO. 4, CAUSES OF INDUSTRIAL PEACE UNDER COLLECTIVE BARGAINING. Hickey-Freeman Co. and Amalgamated Clothing Workers of America. Donald B. Straus, vice president, Management-Employee Relations, Inc. 88 pages. Tables, exhibits, appendixes A, B. $1.

INDUSTRIAL HEALTH DEPARTMENT FUNCTIONS AND RELATIONSHIPS. Subtitled "A Quarter of a Century of Progress in Industrial Health Administration." C. O. Sappington, M.D. Medical Series; Bulletin No. VIII. Industrial Hygiene Foundation, 4400 Fifth Ave., iPttsburgh 13. 98 pages. Photographs, tables, appendix. $2.

COLLECTIVE BARGAINING IN THE TRUCKING INDUSTRY. Nathan P. Feinsinger. Wharton School of Finance and Commerce, University of Pennsylvania Press, 3446 Walnut St., Philadelphia 4. 71 pages. Table, list of contracts. 75¢.

THE SIGNIFICANCE OF WAGE UNIFORMITY. Thomas Kennedy. Wharton School of Finance and Commerce, University of Pennsylvania Press, 3436 Walnut St., Philadephia 4. 40 pages. 75¢.

A SHORT SURVEY OF INDUSTRIAL MANAGEMENT. Occasional Papers No. 1. L. Urwick. British Instiute of Management, 17 Hill St., London, W. 1. 31 pages. 2/6.

HEALTH PROBLEMS IN INDUSTRY. A Digest of the Proceedings of the Joint Conference of Doctors and Businessmen, sponsored by the Commerce and Industry Assn. of New York, Inc., in cooperation with the N. Y. Academy of Medicine, N Y. County Medical Society, and the Institute of Industrial Medicine. Published by the Institute of Industrial Medicine, 141 Broadway, New York 6. 24 pages. No charge.

YOUR GUIDE TO SAFETY WHEN BLASTING. Accident Prevention Dept., Association of Casualty & Surety Companies, 60 John St., New York 7. 34 pages. Sketches, tables. Available through member companies of the association.

YOUR GUIDE TO SAFETY WHEN DISPOSING OF FLUORESCENT AND MERCURY VAPOR LAMPS. Accident Prevention Dept., Association of Casualty & Surety Companies. 60 John St., New York 7. 6 pages. Available through member companies of the association.

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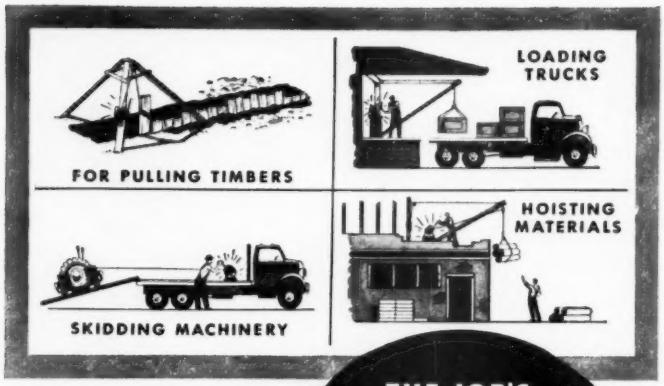

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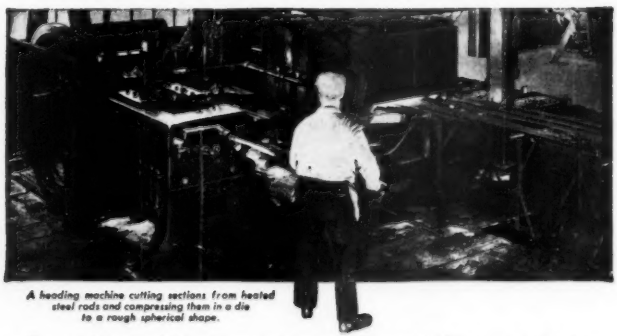

A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape.

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

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WORKING UNDER THE WAGE-HOUR LAW. Management Report No. 27. William B. McComb, administrator, Wage & Hour Div., U.S. Dept. of Labor. Research Div., California Personnel Management Assn., 870 Market St., San Francisco 2. 18 pages. Photograph. $1.

GETTING DOWN TO FACTS IN UNION NEGOTIATIONS. Management Report No. 21. J. D. Fenton, industrial relations director, Pan-American Airways. Research Div., California Personnel Management Assn., 870 Market St., San Francisco 2. 7 pages. Photograph. $1.

IMPACT OF UNIONIZATION ON SOUND PERSONNEL RELATIONS. Management Report No. 20. Hiram S. Hall, director of personnel administration, Bigelow-Sanford Carpet Co. Research Div., California Personnel Management Assn., 870 Market St., San Francisco 2. 8 pages. Photograph. $1.

OUR WAGE AND SALARY DILEMMA. Management Report No. 18. William S. Hopkins, director, Institute of Labor Economics, University of Washington. Research Div., California Personnel Management Assn., 870 Market St., San Francisco. 11 pages. Photograph. $1.

ON THE CALENDAR

MARCH

3-5, American Society of Training Directors, 5th Annual Meeting; Hotel Carter, Cleveland. F. S. Laffer, General Chairman, Graphite Bronze Co., 17000 St. Clair Ave., Cleveland.

8-10, The Society of Automotive Engineers, Production Clinics; Book-Cadillac Hotel, Detroit. John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York 18.

10-12, American Society of Tool Engineers, 17th Annual Meeting; Hotel William Penn, Pittsburgh. Harry E. Conrad, Executive Secretary, 10700 Puritan Ave., Detroit 21.

13-18, National Electrical Manufacturers' Association, Spring Meeting; Edgewater Beach Hotel, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

17-18, American Management As-

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Efficiently and Economically

"Right on the Job!"

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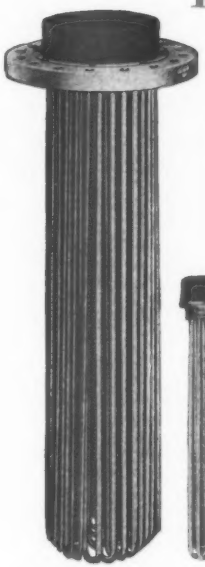

TMO Type Immersion Heaters are made in sizes up to 75 KW to operate in temperatures up to 800° F. and pressures up to 600 pounds.

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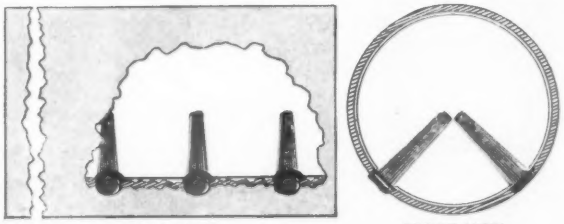
CHROMALOX Electric Immersion Heaters give you the *exact* temperatures you require and maintain these temperatures accurately. Dependable performance, economical operation, reduced spoilage are among other advantages gained by using these easy-to-install heaters.



GIANT STEAM ACCUMULATOR USING CHROMALOX IMMERSION HEATERS (SIMPLIFIED VIEW)

Twenty-four TMO Heaters of 24 KW each are used in this steam accumulator (approximately 72 feet long, 8 feet diameter) to maintain 300° F steam temperature.

This installation was worked out on the job by Chromalox Application Engineers who are always ready to help solve your heating problems.

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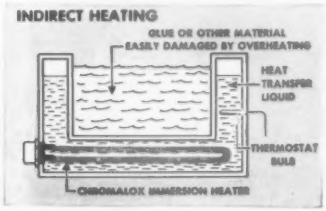
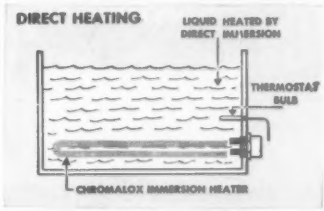
Typical Examples

of a few of the many uses for Chromalox Immersion Heaters



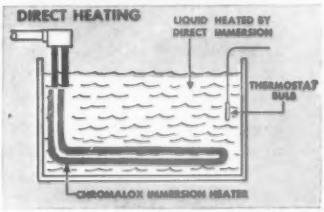
WATER OR OIL JACKETED KETTLES

Heaters are quickly and easily mounted in kettle wall; temperatures are accurately maintained manually or by automatic control. Uniform heat transfer makes this application particularly good for liquids that must be heated slowly to prevent damage by overheating.



HEATER MOUNTED PERMANENTLY IN TANK

Chromalox Immersion Heaters are welded or bolted through tank wall. Heaters are sheathed in copper, steel or alloy—as required to defeat corrosion. Temperatures are controlled thermostatically. Heat is absorbed directly and efficiently.



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sociation, Conference on Marketing; Hotel Statler, New York. E. O. Malott, Manager, 330 West 42nd St., New York 18.

24-25, Industrial Relations Center, 7th Annual Institute; University of Minnesota, Minneapolis. Herbert G. Heneman, Jr., Chairman, Industrial Relations Center, University of Minnesota, Minneapolis.

27-April 1, American Chemical Society, Spring Meeting; Fairmont Hotel, San Francisco. Alden H. Emery, Secretary, 1155 Sixteenth St., N. W., Washington, D. C.

29-April 1, International Lighting Exposition, 3rd International Exposition and Conference; Stevens Hotel, Chicago. B. F. Stevens, 326 West Madison St., Chicago 6.

29-April 1, Safety Engineers, Annual Convention; Hotel Statler, New York. Paul F. Stricker, Executive Vice-President, Greater N. Y. Safety Council, 60 East 42nd St., New York 17.

APRIL

2-9, American Association of Industrial Physicians and Surgeons, 34th Annual Meeting and Industrial Health Conference; in conjunction with American Conference of Governmental Industrial Hygienists, American Industrial Hygiene Association, American Association of Industrial Dentists, and American Association of Industrial Nurses; Book-Cadillac and Statler Hotels, Detroit. Dr. Edward C. Holmblad, Managing Director, 28 East Jackson Blvd., Chicago 4.

11-13, American Society of Lubrication Engineers, Annual Convention and Lubrication Show; Hotel Statler, New York. W. F. Leonard, Secretary-Treasurer, 343 South Dearborn St., Chicago 4.

11-14, National Association of Corrosion Engineers, Annual Conference and Exhibition; Netherland-Plaza Hotel, Cincinnati. A. B. Campbell, Executive Secretary, 905 Southern Standard Bldg., Houston 2.

11-15, American Society for Metals, 6th Western Metal Congress and Exposition; Shrine Auditorium, Los Angeles. W. H. Eisenman, Managing Director, 7301 Euclid Ave., Cleveland 3.

12-13, American Management Association, Production Conference; Waldorf-Astoria, New York. F. Schneider, Manager, 330 West 42nd St., New York 18.

18-20, Midwest Power Conference,

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Left: Model 303A—30 Tons Cap. Above: "Look Down" view shows center hole construction.

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Annual Meeting; Sherman Hotel, Chicago. Ronald A. Budenholzer, Director, Technology Center, Chicago 16.

19-20, California Personnel Management Association, 21st Pacific Coast Management Conference; Claremont Hotel, Berkeley, Calif. A. B. Tichenor, President, 442 Flood Bldg., San Francisco 2.

21-22, The Society for the Advancement of Management, Inc., Time Study and Methods Conference; Hotel Statler, New York. Carl S. Coler, Executive Director, 84 William St., New York 7.

25-27, Triple Mill Supply Convention: American Supply and Machinery Manufacturers' Association, Inc., National Supply and Machinery Distributors' Association, and Southern Supply and Machinery Distributors' Association; Cleveland Auditorium, Cleveland. James J. DeMario, Chairman, Raybestos-Manhattan, Inc., Passaic, N. J.

28-30, National Council of Industrial Management, Annual Meeting; Niagara Hotel, Niagara Falls, N. Y. William F. Meyer, Executive Secretary, 347 Madison Ave., New York.

MAY

2-3, Association of Iron & Steel Engineers, Annual Spring Conference: Lord Baltimore Hotel, Baltimore. T. J. Ess, Managing Director, 1010 Empire Bldg., Pittsburgh 22.

2-4, American Society of Mechanical Engineers, Spring Meeting; Hotel Mohician, New London, Conn. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York 18.

2-5, Chamber of Commerce of the United States, Annual Meeting; Chamber Building, Washington. T. Kelley Back, Assistant Secretary and Controller, 1615 H St., N. W., Washington 6.

2-13, British Industries Fair, 1949 Third Postwar Exhibition: engineering industries, Castle Bromwich, Birmingham; lighter industries, Earl's Court and Olympia, London. British Information Services, 30 Rockefeller Plaza, New York 20.

5-6, American Society for Quality Control, Annual Meeting; Copley Plaza Hotel, Boston. Warren R. Purcell, General Chairman, Lamp Div., Sylvania Electric Products, Inc., Loring Ave., Salem, Mass.

9-13, American Management Association, Conference on Packaging; Auditorium, Atlantic City, N. J.

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FIG. 2228 SCREW ENDS
FIG. 2229 FLANGE ENDS
Double disc, rising stem

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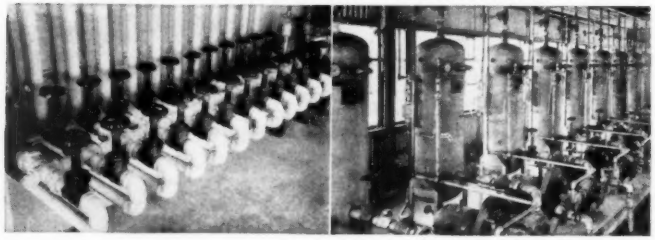
Views in modern plant of W. P. Fuller & Co., pioneer western paint mfrs., San Francisco, Cal. Mech. and elec. engineer: G. M. Simonson. Mech. contr.: Scott Co., San Francisco.



E. Moss, Manager, 330 West 42nd St., New York 18.

26-27, Society of the Plastics Industry, Annual Meeting; Edgewater Beach Hotel, Chicago. William T. Cruse, Executive Vice President, 295 Madison Ave., New York.

JUNE

1-3, American Leather Belting Association, Spring Meeting; Shawnee Inn, Shawnee-on-the-Delaware, Pa. E. R. Rath, Executive Vice President, 41 Park Row, New York.

5-10, The Society of Automotive Engineers, Semi-Annual Meeting; French Lick Springs Hotel, French Lick, Indiana. John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York 18.

5-9, American Society of Refrigerating Engineers, Spring Meeting; River Cruise on the St. Lawrence and Saguenay Rivers, starting from Montreal. Burgess S. Jennings, President, 40 West 40th St., New York.

6-8, Industrial Recreation Association, Annual Conference; Book-Cadillac Hotel, Detroit. John W. Fulton, Executive Secretary, 185 No. Wabash Ave., Chicago 1.

8-9, American Management Association, General Management Conference; Waldorf-Astoria, New York. James O. Rice, Manager, 330 West 42nd St., New York 18.

19-22, National Association of Cost Accountants, Annual Meeting; Palmer House, Chicago. Arthur Gunnarson, Secretary, 51 Madison Ave., New York.

20-22, National Association of Purchasing Agents, Annual Convention; Stevens Hotel, Chicago. G. A. Renard, Executive Secretary-Treasurer, 11 Park Place, New York 7.

20-24, American Institute of Electrical Engineers, Summer General Meeting; New Ocean House, Swampscott, Mass. H. H. Henline, Secretary, 29 West 39th St., New York 18.

27-30, American Society of Mechanical Engineers, Semi-Annual Meeting; Extension Building, University of California, San Francisco. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York

27-July 1, American Society for Testing Materials, 52nd Annual Meeting; Chalfonte-Haddon Hall, Atlantic City. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

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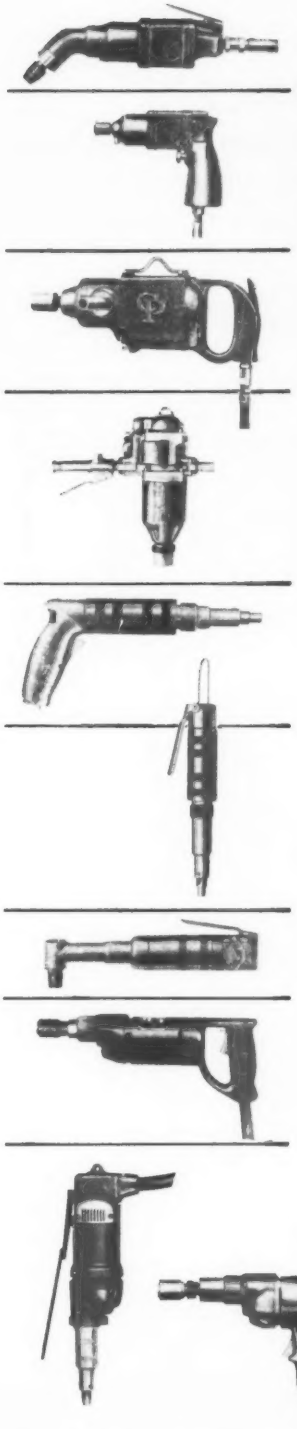

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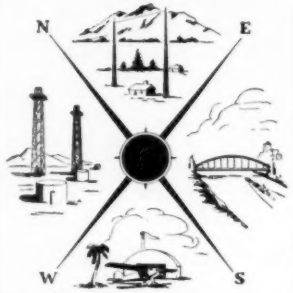

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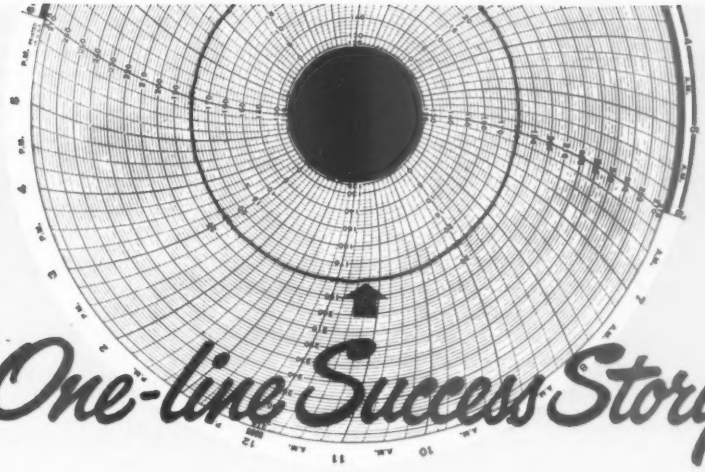
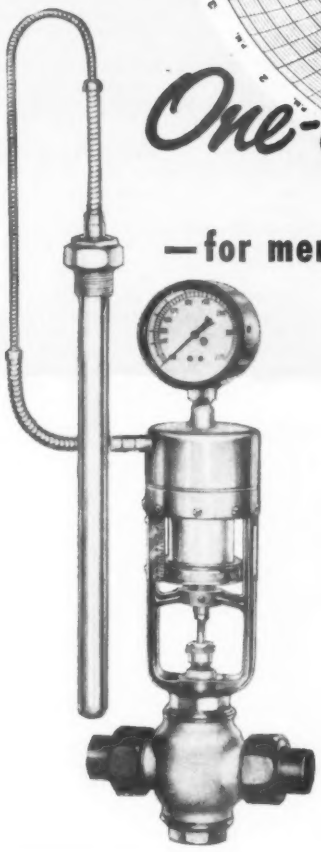


One-line Success Story

—for men who seek process improvements



There's a "success story" in the temperature chart shown above—of equal importance to processors as well as the men who make processing equipment.

To processors of food, chemicals, textiles or a host of other commodities, the uniform reading on the chart shows how Sylphon Temperature Regulators, attached to processing equipment, help maintain desired product-quality . . . help prevent spoilage . . . eliminate wasteful overheating.

To the equipment manufacturer, the chart shows how these regulators, as standard equipment, help insure the satisfactory performance of the machines you make.

Fulton Sylphon can help you be certain of a control that's *right* for the job. Specialists in this field for 44 years, we've developed accurate temperature regulators for practically all processing needs. No. 923-T shown at left is typical. Available with or without thermometer.

Rugged, compact, self-contained and self-powered, they are built for long, trouble-free service. Write today for Catalog ED-A that gives complete details on the full line.

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Temperature Controls • Bellows Devices • Bellows Assemblies

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Keep Your DUST Out of the Air and Your PROFITS in the Bag—

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MIKRO-COLLECTOR

The new MIKRO-COLLECTOR*, which supplements the well known line of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS, is truly a triumph in the art of dust collection. For, it is radically different from any other system of its type. The revolutionary principles employed insure optimum dust recovery and sensational filter rates.

With its perpetually clean filter of hard pressed wool felt, the MIKRO-COLLECTOR has proved its ability to handle highly concentrated dust loads. It performs with equal efficiency as an auxiliary to any type of grinding machinery, or in general air clarification. Made in single and multiple-bag units of varying bag lengths to meet individual requirements.

If you have a dust control problem let our engineers study it for you. Our research laboratory and test facilities are available without charge or obligation.

PULVERIZING MACHINERY COMPANY

24 Chatham Road • Summit, N. J.

*Patents applied for by H. J. Hersey, Jr., and Pulverizing Machinery Company

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By the makers of

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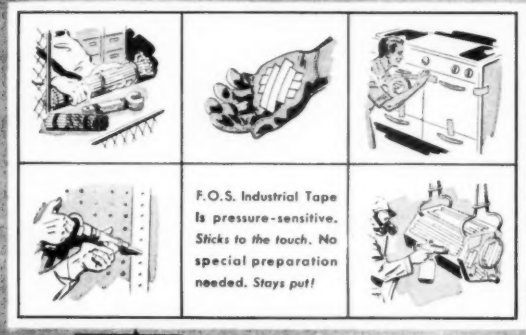

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other products. Roots-Connersville Blower Corp.

10

BRAKEMOTORS, A.C and D.C.—built to specifications. Sizes, ratings, different types, with photographs. Chart of torque, brake size, applicable motor frame sizes. 8-page Bulletin B-501. Star Electric Motor Co.

11

COLOR PLANNING—12-page 5-color brochure, with sketches, photographs, for planning plant painting. 108 tested color combinations shown on color selector, called Dial-A-Tone. Explanation of advantages of using color in the plant. Valdura Div., American-Marietta Co.

12

COMPRESSOR—for spray painting, other uses. Sizes, capacities, description of applications, specifications. DeVilbiss Co.

13

CONDUIT, RIGID STEEL—easy bending. Report of tests, technical features. Photographs of specimens; tables of specifications on conduit, couplings, elbows. Two finishes described. Steel & Tubes Div., Republic Steel Corp.

14

CONNECTORS, ELECTRIC—Photographs showing construction of bolted-type terminal connectors, power connectors; expansion bends, connectors; clamps; other items. Tables of dimensions, capacities, dimensions, switches, conductors, prices. 40-page GEC-400.

15

CONTACTORS, A.C.—multipole magnetic type, 2 sizes. Features, applications, contact combinations, ratings; construction; dimensional drawings; photographs. Bulletin 4454-4455. Ward Leonard Electric Co.

16

CONTROL, HUMIDITY—called Kathabar. What it is, how it operates, with diagram showing operation; equipment. Photographs of different models, applications. Surface Combustion Corp., Kathabar Div.

17

CONTROL, MAGNETIC—Automatic transfer, emergency lighting, remote control switches; a.c. and d.c. contactors, relays; solenoids; other equipment. Diagrams, photographs, operating features of each type. 16-page condensed Catalog 700. Automatic Switch Co.

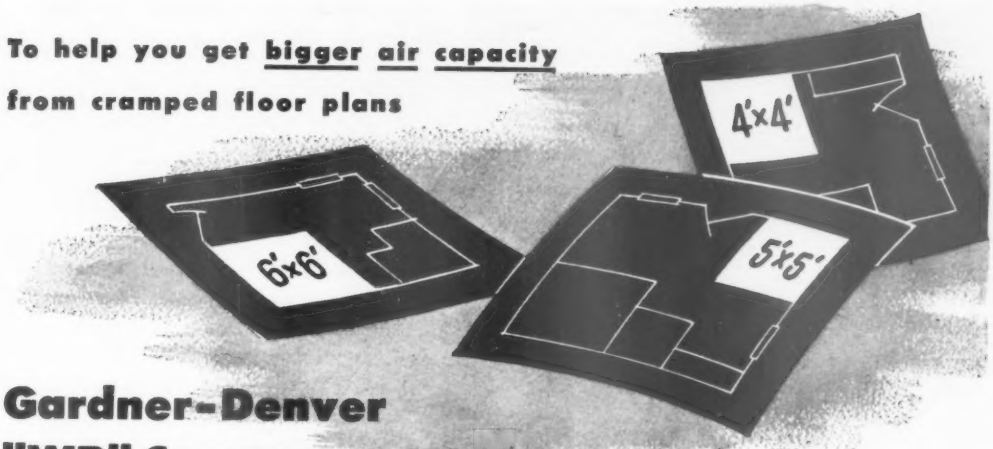
18

CONTROL, TEMPERATURE—called Weather-Chron, for outdoor installation and indoor thermostat control. Explanation, features, installation diagram. Automatic Devices Co.

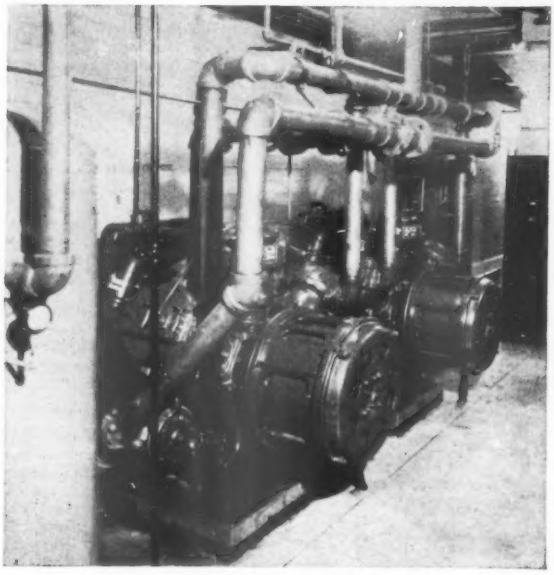
19

CONTROL UNIT—called Short-Stroke Dancer Roll, for use where controlled excitation of a motor or generator field is necessary. Description of function, characteristics, uses. Chart showing range of

To help you get bigger air capacity from cramped floor plans



Gardner-Denver "WB" Compressors are made in 7 sizes!



Compact Gardner-Denver "WB" Two-Stage, Vertical Water-Cooled Compressors, with built-in motors.

Here's how you can have *greater air capacity* — even though floor plans are crowded! Install a Gardner-Denver "WB" — the vertical, two-stage compressor that's built in seven space-saving capacities from 142 to 686 cubic feet displacement per minute. The smallest size fits into a four-foot square — the largest requires only about six feet each way.

Compactly designed with integral motor and self-contained cooling system, the "WB" rates high in efficiency. Completely water-jacketed cylinders and heads, plus balanced construction — two low pressure cylinders for each high pressure cylinder — assure low power costs and an air supply you can always count on.

Other big "WB" advantages:

- ★ Duo-Plate "air-cushioned" valves — quiet, simple and durable.
- ★ Timken tapered roller main bearings.
- ★ Force-feed lubrication system.
- ★ Furnished with built-in motor — or with sheave for "V"-belt drive.

For complete information, write Gardner-Denver Company, Quincy, Illinois.

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RUST

Costs the Nation $6,000,000,000* Yearly!

Day and night—*twenty-four hours a day*—rust gnaws at your property. Not as dramatic as a tornado or other fear-inspiring disaster, rust costs you plenty in a year's time. You pay your full share of the nation's annual $6 billion loss from rust . . . unless you protect iron and steel surfaces against this *metal-consuming* menace.

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RUST-OLEUM *Stops Rust!*

VSS output voltage; photograph and schematic diagram of typical application. Reliance Electric & Engineering Co.

20

CONTROLS, PHOTOELECTRIC LIGHTING—single-unit, synchronous time-switch. Uses, advantages, operation; technical features, mounting data; photographs. Fisher-Pierce Co.

21

CONVEYORS—"How to Save Money Moving Materials," 4-page Bulletin 1490. Photographs of applications, construction details of 12 types. Lippmann Engineering Works.

22

COUPLINGS, FLANGE — suitable for heavy service. Plain, male and female, reducing couplings; separating plates. Descriptions, specifications, dimensions, prices. Also Taper-Lock rigid couplings, with similar information. Dodge Mfg. Corp.

23

CRANE—called Handi-Crane, 4-ton capacity. Photographs of applications, features, construction. Radius diagram, load chart, specifications. Clyde Iron Works, Inc., subsidiary of Barium Steel Corp.

24

CRANE, MOBILE SWING BOOM—in 4 sizes. Features, operating data, specifications. Clearance, reach, and capacity charts; diagrams. Photographs of attachments, accessories. 4-page Bulletin 79. Silent Hoist & Crane Co.

25

CYLINDERS, HYDRAULIC—Photographs, cut-away drawings of construction features, applications, diagrams, mounting instructions, specifications of different models. Also valves, pumps. 18-page Catalog Section 103. Gerator May Corp.

26

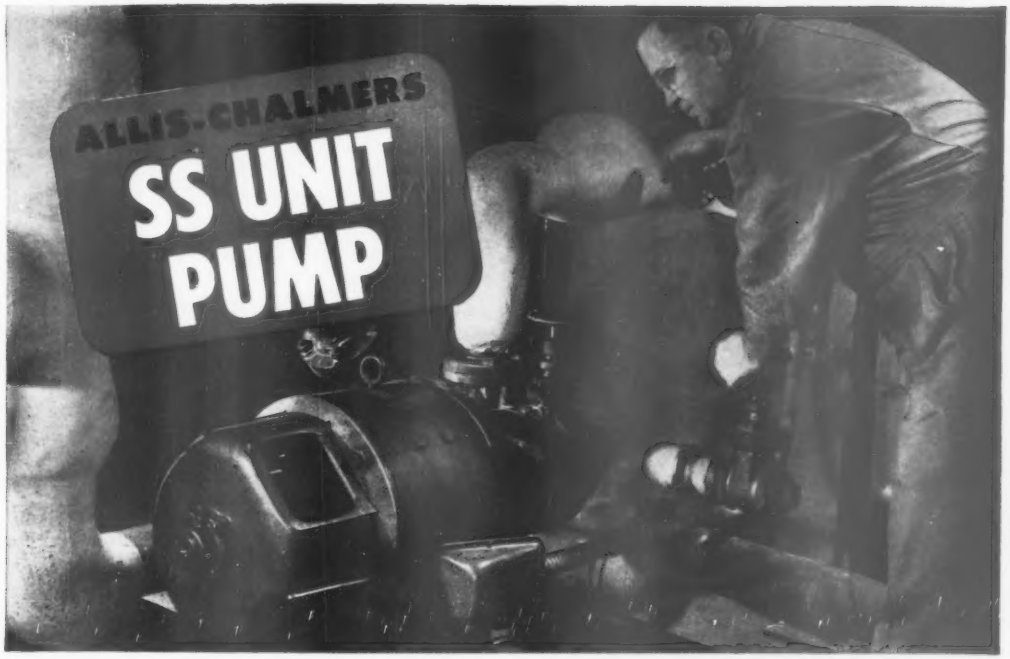
DEFROSTING SYSTEM, HOT GAS—automatic. Diagrams of operation at various stages in defrosting cycle of typical 2-evaporator system. 4-page Bulletin DF-100. Patterson-Kelley Co., Inc.

27

DILUTERS, CONE-TYPE—for L-P gas standby. Description of construction, operation; tables of mixtures, electrical characteristics, capacities, dimensions, with diagram. Eclipse Fuel Engineering Co.

28

DISTRIBUTION EQUIPMENT—**28(a)** 12-page Bulletin 201, standardized safety-type service equipment; enclosed cutouts; panelboards. Description, specifications, photographs, diagrams of different kinds. **28(b)** Load centers and service equipment with Type A.C. Thermag circuit breakers. 8-page Bulletin 202. Photographs, capacities, specifications, different kinds for different applications. **28(c)** Enclosed branch circuit breakers with Type A.C. junior circut breakers. 4-page Bulletin 203. Photographs, design features, spec-



50% MORE WATER
33% LESS POWER

"Our *old* displacement pump required 15 hp motor to raise 100 gpm 110 ft to roof tanks. *Now* this A-C SS Unit Pump Lifts 150 gpm to same tanks with only a 10 hp motor!"

THAT'S THE EXPERIENCE, along with worthwhile savings in space and maintenance, reported by the chief engineer of a large commercial building.

It is the kind of saving that you, too, may be able to make with Allis-Chalmers SS Unit Pumps. Here are 4 reasons why:—

Deliver Rated Efficiencies — Every unit tested at the factory and the performance curve plotted. Efficiency is proved.

Heavy Construction — Compare section thicknesses, shaft diameters and other features. See why SS Unit Pumps run years without repairs.

Easy Maintenance — Compact design and few parts reduce maintenance. Bronze ring protects casing from wear. Is easily replaced when required.

Application Engineering — When a pump is recommended by an A-C Pump Application Engineer, you know that you are getting the pump that fits your needs exactly and that will give you dependable service at low cost per gallon.

SS Unit is one of many Allis-Chalmers models for most industrial pumping services. For information, see your Allis-Chalmers Authorized Dealer or District Office. Or write for Bulletin 52B6059E. Also listed in Sweet's. A 2595

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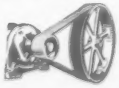
by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



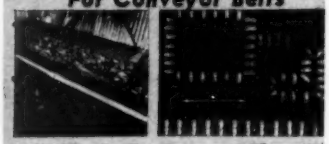
PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

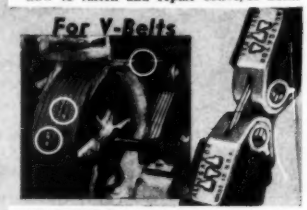
For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts



ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington St., Chicago 44, Ill.

ifications. **28(d)** 4-page Bulletin 302, Dustite light and power panelboards, for hazardous locations. Description, connection information, specifications. Frank Adam Electric Co.

29

DUST COLLECTOR — "Midget" Model 335. Recommendations for use, applications, descriptions, specifications, ratings. Aget-Detroit Co.

30

ELECTRODES—10-page Booklet reports tentative specifications for copper and copper-alloy metal arc welding electrodes. Ampco Metal, Inc.

31

ELECTRODES, HARD SURFACING—"Weldirectory for Hard Surfacing," 16-page Bulletin 466. Discussion of processes, selection chart for specific product for special jobs, photographs of typical applications and description of each type. Lincoln Electric Co.

32

ELEVATORS—**32(a)** Freight elevators, called for Pow-R-Truck, for heavy-duty service. Features, construction data, controls, safety devices, Hoistway requirements. Table of sizes, capacities. **32(b)** Light-duty elevators, self-supporting. Mechanical design, electrical operating systems, installation data, with diagrams. Table of car and hoistway dimensions. Otis Elevator Co.

33

FANS—"NAFM Standards for Classifying Air Moving Equipment," 4-page Bulletin 108. Sketches of 8 different types, functions of each. National Assn. of Fan Manufacturers.

34

FASTENING, ANCHORING DEVICES—for use in masonry. 23-page Catalog 60. Photographs, specifications, dimensions of different kinds, prices. Expansion Bolt Co.

35

FLOOR COVERINGS — different types, rubber, metal, for different uses. Also matting, pads, stair treads. Photographs, sizes. 6-page folder. American Floor Products Co.

36

FLOOR DRY—No. 85, for absorbing oil, grease, other liquids. Characteristics, description of applications, test report. Photographs, sketches. Eagle-Picher Co.

37

FLUORESCENT FIXTURE — for sidewall use. Description of Westinghouse Circlarc bulb used, construction details, applications. Homecraft Electronic Products.

38

FURNACES — gas-fired. Descriptions, photographs of models for specific purposes; temperature ranges, specifications, selection table. Surface Combustion Corp.

39

GAS COMBUSTION ASSEMBLY—called Gas Pak, for firing steam boilers, water heaters, heating plants,

TOOL and DIE USERS!

Pangborn "Hydro-Finish"

Can Help You...

It improves surface finish, removes oxide scale, increases tool and die life through proper maintenance. Hydro-Finish is the new versatile impact blasting process that uses a fine mesh abrasive suspended in water and holds tolerances to .0001 inches.

In the Tool Room, Hydro-Finish simplifies the manufacture and maintenance of tools, dies and molds. It reduces usual costly handwork and produces a surface virtually free from directional grinding lines.

In the Production Line, Hydro-Finish eliminates many tedious finishing operations. It reduces cost and time involved in buffing. It improves fatigue life of the metal parts it finishes. It cuts many manufacturing costs.

It can be used for deburring, surface finishing and lubrication control, removing heat treat scale and discoloration, preparing surfaces for plating or coating, removing directional grinding lines, finishing threaded section for better workability and fit, improving manufacturing, maintenance and life of tools and dies, general maintenance cleaning.

Find out today how Hydro-Finish can pay off for you. Write for Bulletin 1400 to PANGBORN CORPORATION, 1282 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for all the latest developments in Blast Cleaning and Dust Control Equipment.

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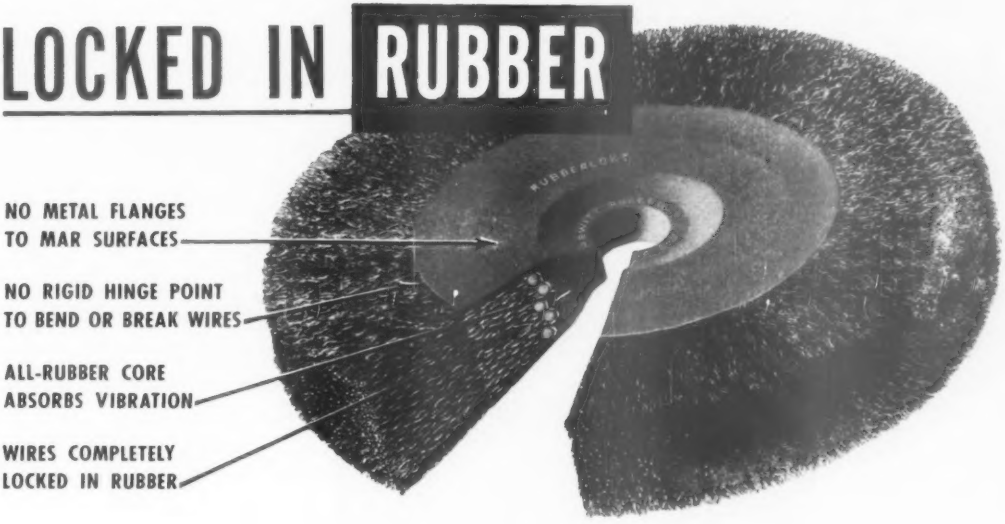
BLAST CLEANS CHEAPER with the right equipment for every job

NOW! A REALLY MODERN WIRE BRUSH...WITH BRISTLES LOCKED IN RUBBER



Due to a new process for imbedding wire in rubber, you can now buy a more efficient kind of rotary wire brush.

It's the HEWITT **RUBBERLOKT** ROTARY WIRE BRUSH . . . with bristles that are *locked in rubber!*

Here are some of the many reasons why you'll say it's a better brush in every way!

Less Vibration—Its special rubber mounting soaks up vibration. So your workers will find it easier . . . and less fatiguing . . . to use on both portable and bench tools.

Easier on Tool Bearings—Less vibration means greater protection for tool bearings and arbor shafts. It means you have less maintenance on those tools, too.

More Brushing Points — Exclusive Hewitt rubber flange keeps bristles in an upright position all during the life of the brush. That provides more brushing points . . . gives you a smoother job.

Better Flare Control — Special rubber flange always brings the wires back to their upright position . . . won't let them bend out or mat down. *Gives brush longer usable life!*

Less Wire Breakage—Rubber mounting reduces bristle ejection. And it also eliminates the rigid hinge point that causes wires to fray and break. Result—*you get a much safer brush!*

Faster, Better Work — Unlike a rigid metal mounting, the Hewitt flexible rubber-locked mounting allows the wires to "give" without bending or breaking. Yet it holds them together compactly under working pressure. So it allows your workers to do a faster, better job . . . even on irregular surfaces.

Investigate the Hewitt **RUBBERLOKT** Wire Brush today. Write Hewitt Rubber Division, Dept. FM-3, 240 Kensington Ave., Buffalo 5, N. Y.

Distributors! Your inquiries invited. Some sales territories still available.

HEWITT
RUBBERLOKT
Rotary Wire Brush

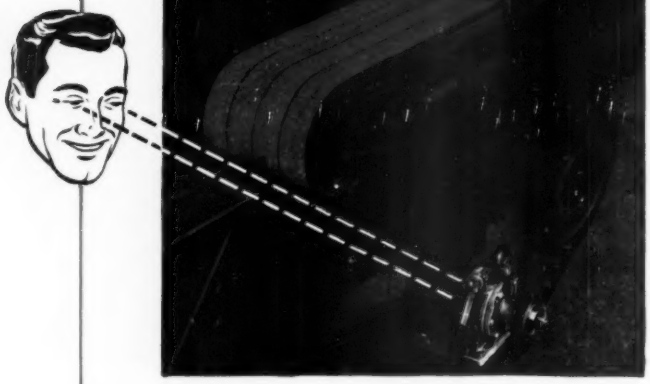
HEWITT RUBBER DIVISION **HEWITT-ROBINS INCORPORATED**

[redacted] To drive a conveyor-belt carrying fragile material and provide automatic belt-speed reduction when drag of load increases.

[redacted] A 1 h.p. Gast Air Motor (Model 4AM-FCC-1) connected to plant compressed air line. Maintains constant tension on material in process despite varying load-drag and belt r.p.m.

[redacted] This successful, variable-speed drive reduced material spoilage on this machine—and saved money.

UNUSUAL CONVEYOR-BELT PROBLEM solved with a variable-speed GAST AIR MOTOR



USED FOR MANY APPLICATIONS—From this case history, you can see how Gast Rotary Air Motors solve some unique power problems. As original components on products in *totally different fields*, they offer unmatched advantages. For example:

AIR MOTORS CAN'T BURN OUT—It's possible to stall them but pneumatic motors can't burn out!

CAN'T SPARK EXPLOSIONS—No spark, no danger—Gast Motors are explosion-proof anywhere.

GIVE YOU VARIABLE R.P.M.—From any position, they start and run at 100 to 2,000—some to 6,000 r.p.m.

THEY'RE AMAZINGLY COMPACT—The 1/6 h.p. motor is only 2½" diameter; 1 h.p. is 6-3/8" x 6" high (with foot.)

AND COST IS LOW—Ruggedly built, they offer unique advantages—and cost less! Why not investigate now? We'll gladly cooperate with engineering help.

"AIR MAY BE YOUR ANSWER!"

WRITE TODAY! Request your copy of GAST'S IDEA-CATALOG

GAST ROTARY

AIR MOTORS - COMPRESSORS - VACUUM PUMPS
(TO ONE H.P.) (TO 30 LBS.) (TO 28 INCHES)
GAST MANUFACTURING CORP., 137 Hinkley St., Benton Harbor, Mich.

ovens, similar equipment. Features, photographs, diagram, dimensions, capacities. Eclipse Fuel Engineering Co.

40

GREASE SEAL—mechanical type. Construction, characteristics, design, mechanical details. Diagram of typical application. Janette Mfg. Co.

41

HAMMER—"no-bounce," with loaded head filled with steel grit to absorb rebound. Plastic Tenite tips, other features described, pictured. Tahlen Metal Industries, Ltd.

42

HAND CLEANSER—called Spun-Derma-C. Discussion of dermatitis, how to combat and avoid it. Description of product, photographs, list of users. L. E. Hicks & Son.

43

HEATING SYSTEM, STEAM—called Supertherm. Comparison of water systems with steam; layout of typical application; features. Tables of heat losses, heat content. Diagrams, photographs, sketches. J. O. Ross Engineering Corp.

44

HEAT MASK—for protection against heat from furnaces, cupolas, soaking pits, similar hazards. Construction features, photographs, descriptions. Bulletin CF-23. Mine Safety Appliances Co.

45

HEAT TRANSFER OIL SYSTEM—for temperatures to 600 degrees F. Cut-away photograph shows construction, operating characteristics; schematic diagram of unit flow; table of specifications. Gerin Mfg. Co.

46

HYDRAULICS—radial pumps, gear pumps, boosters, valves, power units. Cut-away photographs and diagrams of construction features, dimension charts, capacities, function of each type. Hydro-Power, Inc., subsidiary of Hydraulic Press Mfg. Co.

47

INSULATION ADHESIVES—sealers, surface coatings, cements, mastics, emulsions. Basic properties, uses, characteristics. Charts of bonding and drying times, colors, temperature limits, thinners, application data. 15-page Reference Manual. Benjamin Foster Co.

48

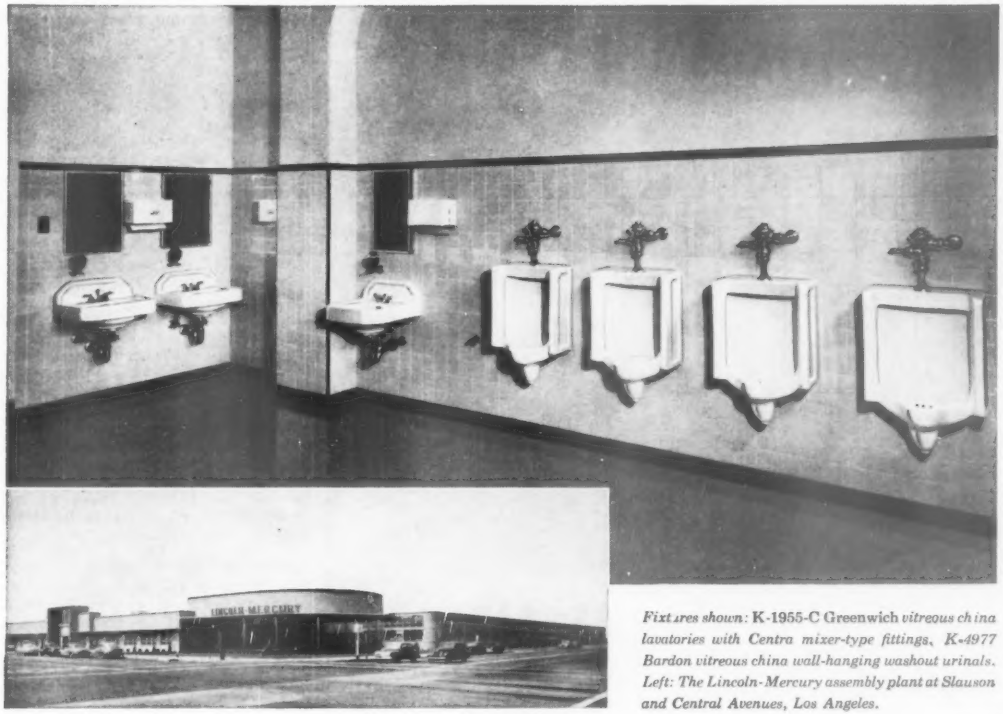
JOINTS — for rubber-lined pipe lines, to be used on the job. Sketches show installation procedure, different types, parts. Gates Engineering Co.

49

LIFT TRUCK—called Lift-O-Krane, which may also be used as a ram truck. Descripton, photographs, specifications, capacities; photographs, dimension drawings. 6-page Bulletin 65. Silent Hoist & Crane Co.

50

LINING, SHEET—to protect chemical, acid, and plating tanks. Application, characteristics, temperature



Fixtures shown: K-1955-C Greenwich *vitreous china lavatories with Centra mixer-type fittings,* K-4977 *Bardon vitreous china wall-hanging washout urinals. Left: The Lincoln-Mercury assembly plant at Slauson and Central Avenues, Los Angeles.*

New Ford Plant has roomy, convenient washrooms with

KOHLER FIXTURES

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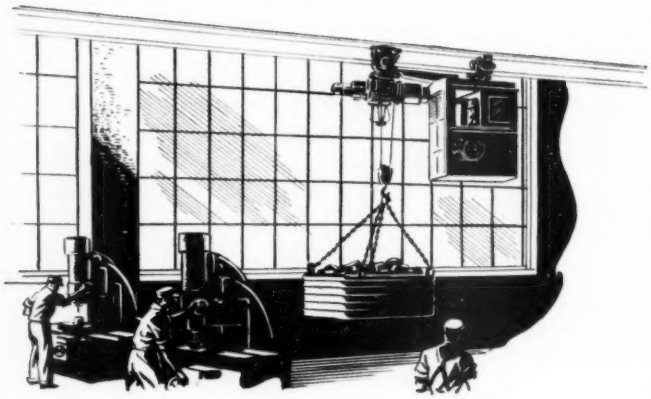

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ratings. Tables of chemical resistance Photographs of installations; advantages, limitations Metalweld, Inc

51

MATERIALS HANDLING DEVICE—called Lowerator, automatic spring-powered racks that lift materials to hand-level as trays are emptied. Photographs, description of different uses, models. 4-page Bulletin DM518 American Machine & Foundry Co.

52

MATERIALS HANDLING EQUIPMENT, OVERHEAD—light cranes and monorail conveyors. General use, fittings, carriers, electrification, assemblies, motor drives, cranes. Photographs, cross-section diagrams; specifications, capacities, construction of different types. Whiting Corp.

53

METAL BENDER—called the Form-Bar Bender. Photographs, features, specifications, applications of different models. Photographs and sketches of different types of bar bends. Parts list; typical installation. Wimfield R. Scott.

54

METER SOCKETS—Series No. 9000. Descriptive data, photographs, diagram showing conversion to horizontal mounting. Anchor Mfg. Co.

55

MOTORS, GEAR—Type UW. Catalog, data, photographs of different types for foot or flange mounting. Motor and gear box specifications, dimensions, mounting diagrams, assembly position elevation views. Janette Mfg Co

56

NOZZLES — flat spray. Different sizes, materials; applications, capacities, specifications, dimensions, sizes, prices of each. Chain Belt Co.

57

OVENS—Construction, methods of heating, materials handling in ovens. Different types for different applications, descriptions, photographs of each. 24-page Bulletin 132. J. O. Ross Engineering Corp.

58

PACKINGS — "Packing for the Chemical Industry," both braided form and molded rings. Different styles explained, illustrated, recommended services and temperatures. Chemlon, a chemically inert packing, featured. Crane Packing Co.

59

PAGING SYSTEM—Silent visual type, for installation in extremely noisy locations where audible signals are not practical. Features, operation, photographs of equipment, description of different types. H. R. Kirkland Co.

60

PALLETS—different types for specific uses. Photographs, sketches showing construction, applications. 4 pages. Acme Pallet Co., Inc.

61

PALLETS, WOOD—Sketches, de-

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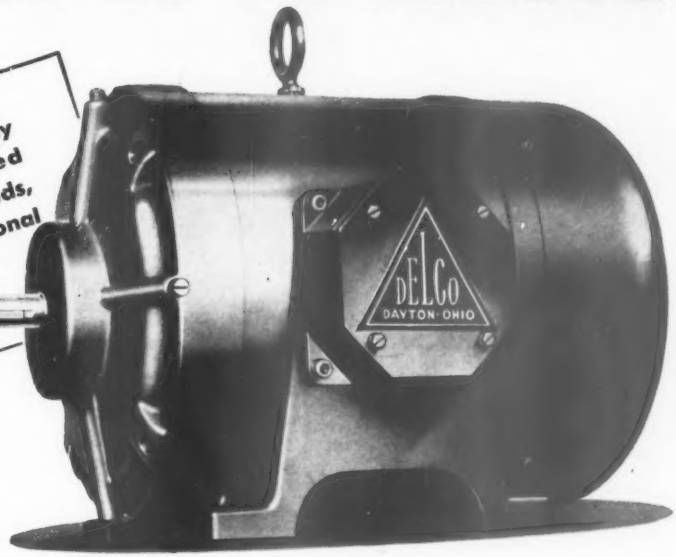

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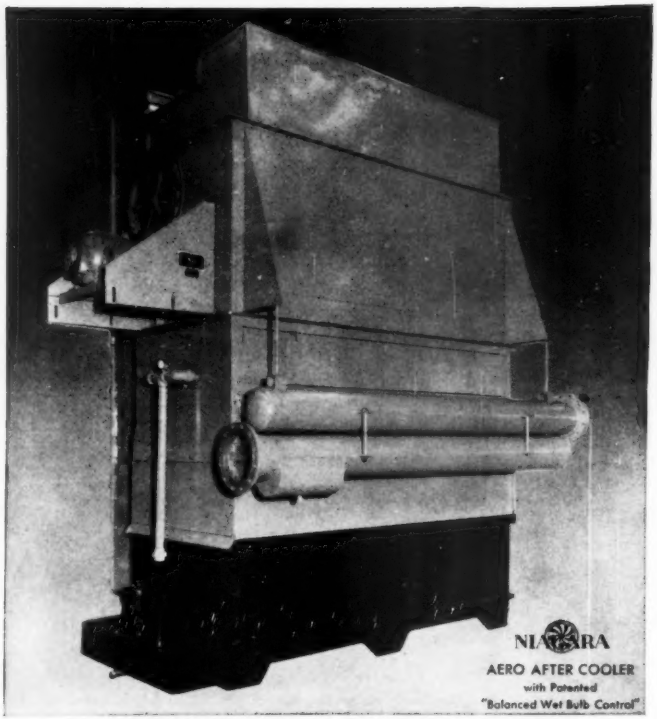
VOLUME 107, NUMBER 3 • MARCH, 1949



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scriptions, applications for different kinds; assembly details; capacities. Photographs of applicatons. Wood Pallet Co., Inc.

62

POWER PLANT EQUIPMENT—Tabularly indexed 4-section catalog. Boiler feed water regulation, excess pressure control, pump governors; air, water, oil, and steam pressure control, level control valve, reducing, desuperheating equipment, with hookups showing application; separators, combination air separator and trap, exhaust heads; feed water heaters, open direct contact, deaerating heaters. Photographs, specifications, descriptions of each. Swartwout Co.

63

PROTECTIVE COATINGS—chemical resistant, called Ucilon. Characteristics, physical properties, descriptions of 11 different kinds. United Chromium, Inc.

64

PROTECTIVE COATINGS—"How to Protect and Repair Metal Equipment for Corrosive Service," using 5 thermosetting resins in cements, coatings, or casting compounds. Applications for each, with primers, fillers. Carboline Co.

65

PUMPS—self-priming, centrifugal; two sizes. Description of self-lubricated shaft seal, other construction features. Rice Pump & Machine Co.

66

PUMPS, FOR PETROLEUM PRODUCTS — Self-priming centrifugal pumps for transfer pumping, fueling service. Features, construction of various types; selection charts, tables of specifications, specific gravity and viscosity, head equivalents, suction lifts, friction loss. Installation data. 12-page Bulletin PM48. Marlow Pumps.

67

RADIATORS, AUTOMATIC ELECTRIC STEAM—cast iron, portable or stationary. Photographs, sketches, features, specifications, sizes, capacities, prices. Koral Electric Mfg. Co., Electrical Radiator Div.

68

REGULATOR, ROTATING—for use in the steel industry. Called Rototrol. Functions, applications, characteristics. 14 sections; photographs, diagrams. Westinghouse Electric Corp.

69

RELAYS—transformers, coils, electrical controls, in loose-leaf binder. Photographs, descriptions, diagrams of each type, with specifications, mounting directions, suggestions for ordering. Comar Electric Co.

70

RUST PREVENTIVE — a primer, called Niel-Coat P-110. Description, characteristics, method of application. 4-page Technical Data Sheet. Nielco Laboratories.

71

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Because EXTRA CARE Goes Into The Windings

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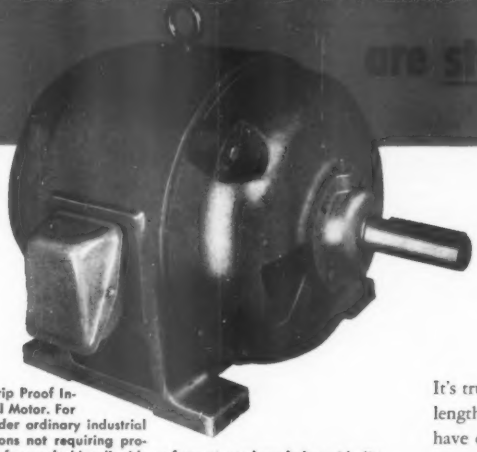

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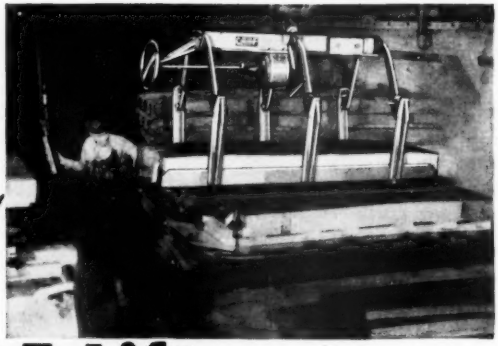

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72

SCAFFOLDS, ROLLING—of tubular steel. 4 basic parts described, pictured; photographs of installations. Patent Scaffolding Co., Inc.

73

SCRAPER, DIRT—Self-loading dirt-mover, called D Roadster Tournapull, 1-man operated. Photographs, construction features, applications, specifications. Broadside TP-189. R. G. LeTourneau, Inc.

74

SEPARATORS, STEAM—Data on 29 types in more than 145 sizes in pipe-size range of 12 to 16 inches, welded steel receiver-separators, other equipment. Charts, tables, diagrams, dimensional tables. Illustrated index. Wright-Austin Co.

75

SHAFTING, FLEXIBLE — 16-page Catalog 49. For power drives, remote controls; flexible shaft machines, accessories; monocoil for push-pull controls; special machinery. Photographs, sketches, specifications, dimensions, tables of characteristics; selection chart for power drive core; applications. Elliott Mfg. Co.

76

SOAP DISPENSER—for liquid or powdered soap. Materials, design of different models, applications. Also valves, tanks, tank-type gravity feed systems, fittings. Bobrick Mfg. Corp.

77

SOCKET SCREW PRICE LISTS—**77(a)** Hex socket screw products, cap screws, set screws, shoulder screws, pipe plugs and keys. List 874. **77(b)** List 875 includes multiple-spline socket set screws, cap screws and keys. Both are 12-page lists, with photographs, drawings, dimensions, descriptions. Bristol Co.

78

SOLDER—and Soldering Technique, title of 28-page manual. Analysis of properties, application of soft solder alloys and soldering fluxes. Photographs, sketches illustrating methods of application, tables of alloys, sizes available. Kester Solder Co.

79

STARTERS, A.C.—construction features, uses of manual and magnetic across-the-line starters, combination starters, reversing starters, push-button control stations. Five different enclosures and open type. Photographs, applications, descriptions of different kinds, 12-page Bulletin 14B7132. Allis-Chalmers.

80

STEAM TRAPS—for unit heaters; how to select by the B.t.u. rating method and condensate weight method. Charts, tables, data on different

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sizes of heaters produced by 24 different manufacturers; conversion tables; recommended sizes; installation diagrams. Armstrong Machine Works.

81

STEEL BUILDINGS — different types of different uses. Structural details, construction drawings, photographs, features of each type. 32-page Bulletin B-48. International Derrick & Equipment Co.

82

STORAGE BATTERIES—in sealed glass. Called Manchex. For stationary power applications. Photographs of component parts, description, cutaway drawing; applications. Electric Storage Battery Co.

83

STUDS—4-page booklet; dimensions, prices, of 60 standard M-G studs for end welding with automatic stud welding gun. Ranges, specifications. Also photographs of special studs. Nelson Stud Welding, Div. of Morton Gregory Corp.

84

SURFACE GRINDING MACHINES —with automatic lubrication, Model 2L and 2LB, for exceedingly dusty or severe operating conditions. Descriptions, specifications, standard equipment. 4-page Bulletin 523-2/1. Brown & Sharpe Mfg. Co.

85

TAKE-UP UNITS—with self-locking collar, Type LTU. Features, unit numbers and dimensions, replacement bearing numbers and load ratings; diagram. Fafnir Bearing Co.

86

TEST SET—Portable direct-reading instrument for measuring turn ratio of power and distribution transformers. Description, photographs, applications, operating diagram, specifications. 8-page Bulletin 55. James G. Biddle Co.

87

THERMOCOUPLES—and pyrometer accessories. "Buyers Guide and Users Manual," Bulletin P1238, 56 pages. Different kinds, applications; tables, drawings, photographs. The Bristol Co.

88

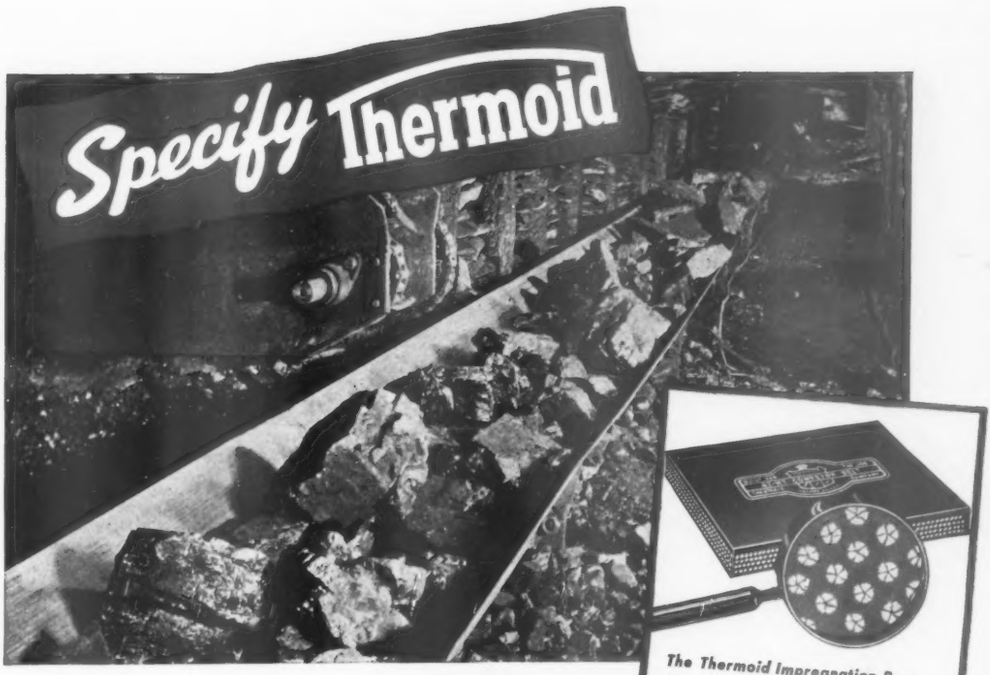
THERMOMETER—stainless steel, in 5-, 3-, 2¼-, and 1-in. dial sizes, stem lengths from 4 to 42 inches. Construction details, uses, calibration. 4-page Bulletin T. W. C. Dillon & Co., Inc.

89

TIRES—pneumatics and solids, of rubber. How to select right tire and wheel for specific jobs, specification charts for different applications, sizes, sketches showing different types of rims, hubs. Also specifications for caster forks, rigid and swivel, pressed-on-solid tires, flat base type. 16-page Form 3357. The General Tire & Rubber Co., Industrial Tire Division.

90

TOILET COMPARTMENTS — five



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UNITED STATES STEEL

types. Construction details, specifications, hardware, materials used. Color chart with 21 color chips. Also hospital cubicles, shower cabinets and stalls, dressing room compartments. Photographs, diagrams. 20-page Catalog 86. The Sanymetal Products Co., Inc.

91

TOOLS, PORTABLE PNEUMATIC—for different types of grinding, sanding, buffing, screw driving and nut setting, drilling, reaming, ramming, scaling. 48-page Bulletin 35. Photographs, descriptions, construction data, dimensions, specifications, uses of each. The Rotor Tool Co.

92

TRANSFORMERS—**92(a)** 80-page 1949 Buyer's Guide, GEA-4626B, on 107 types of standard instrument transformers, both indoor and outdoor uses. Ratings, accuracy classifications, prices; tables of mechanical and thermal limits. **92(b)** Outdoor potential transformers, dry-type, 60 cycles, full-wave 60 kv. Application, construction, ratings, weights; ratio and phase-angle curves, dimensional diagrams. GEA-448. General Electric Co.

93

TRUCK DRIVE—using power transmitted by means of magnetic induction on 6000-lb. capacity fork-lift truck. 10-page booklet explains device, called Dynatork Drive. Photographs, sketches. Clark Equipment Co., Industrial Truck Div.

94

TRUCK TIRES—descriptions, sizes, loads, dimensions of different kinds; also tires for wheelbarrows, rims, passenger car tires, batteries, brake blocks, spark plugs, and valves, with diagrams, specifications, dimensions, other data. Table of weights, index. 112-page booklet. Firestone Tire & Rubber Co.

95

TRUCKS—called Lift King **95(a)** Gasoline-powered: photographs, construction details, capacities, features, load capacity chart. 8-page Bulletin 5101. **95(b)** Electric: Bulletin 5151. 9 pages. Same information. Yale & Towne Mfg. Co.

96

TRUCKS, CRAWLER - TREAD HAND—ten different models, called Escort trucks. Photographs, description, capacities of each, with price list. Associated Services.

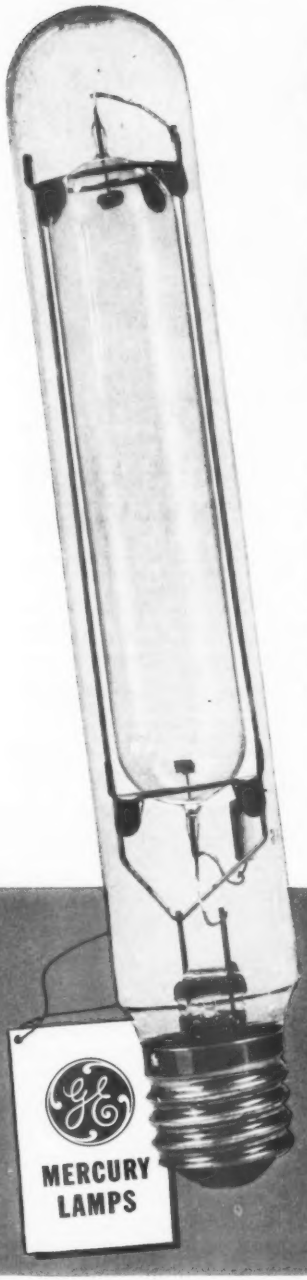
97

TRUCKS, FORK LIFT—"Operators Guide," 30-page booklet. Suggestions for operation of various types, discussion of loads, containers, load techniques; accessories. Towmotor Corp.

98

WALKWAYS AND RACKS—42-page Catalog 54, Part 1, Section 6. Materials, features, how to erect; different types of stairways, walkways, loading racks. Photographs,

How to step up lighting efficiency and save on maintenance, too



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Indirect lighting at low cost. 60 to 1000 watts.
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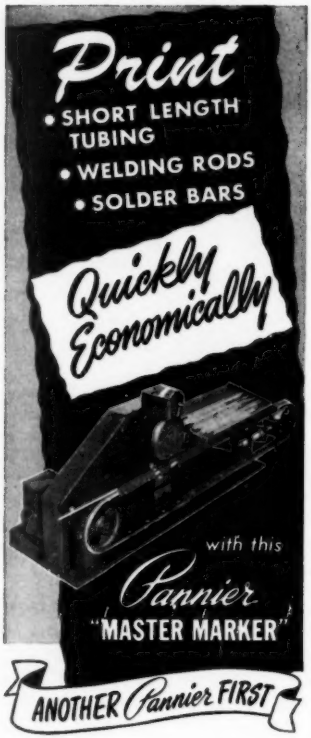

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diagrams, specifications. Black, Sivalls & Bryson, Inc.

99

WARNING LIGHT—called Explosilite, that flashes red when gas hazards are present. Portable, battery-operated. Used in tanks, vaults, manholes. Features, construction; photographs; sketches showing uses. Bulletin DT-4. Mine Safety Appliances Co.

100

WASTE RECEPTACLES — metal, with stainless steel feet. Photographs, descriptions of different models. Also galvanized liners. Bennett Mfg. Co.

101

WATER COOLER—pressure bubbler type, electric. Features, construction data, photographs of different types, installation diagrams. 4-page Folder M-10-19. Cordley & Hayes.

102

WATER COOLERS, FILTERS—and rectifiers. **102(a)** Form 32, 4 pages, describes general line, with photographs, descriptions, applications; dimensions, capacities; working diagram. **102(b)** Form 119, 6-page folder, explains use of filter No. 4, with cut-away view of construction, suggested applications, description. Filtrine Mfg. Co.

103

WATER DEMINERALIZER—called Hydrion. Cartridge type. Description, characteristics, cartridge life, photograph, specifications. Diagram of installation. A. E. Tomkin Co.

104

WHEELS—104(a) Ball-race grinding wheels; Bulletin 1948BR. **104(b)** Rubber-bonded polishing wheels. **104(c)** Resinoid-bonded cut-off wheels, Bulletin 4949B. **104(d)** Abrasive cut-off wheels, rubber-bonded. Bulletin 4948R. Sketches, photographs, recommendations, ordering information. Allison Co.

105

WIRE ROPE—"Wire Rope Is a Machine," 96-page booklet. Explains how wire rope works, how it should be operated, how to select and order correct type for specific uses. Cartoon-type illustrations demonstrate installation procedure, operating principles, selection, fittings, slings, splicing service, and recommendations. Wire Rope Sales, Jones & Laughlin Steel Corp.

106

V-BELTS—multiple and light duty. Drive tables, sheave data, fractional horsepower drive layouts, comparison tables with information on quarter turn and hexagon double V-drives. U. S. Rubber Co.

107

VISES—for holding parts of varying thickness in drilling, grinding, boring, milling, assembling, general toolroom use. Photographs of different models, applications. Bulletin 201. Hartmann Mfg. Co.

"Hands off" handling...

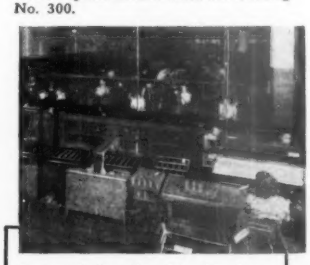
with Buschman "ENGINEERED" CONVEYORS

You can make your entire production system a "no hands" affair with Buschman Conveyors.

Efficient Handling Reduces Costs. Whatever your needs, for receiving, manufacturing, assembly and shipping, there's a Buschman Conveyor to do the job.

For that "tough" conveyor problem, let Buschman Engineers take over. They'll show you — at no obligation — how Buschman low-cost Conveyors fill your needs.

For complete details write for Catalog No. 300.



Designed for the job, Buschman "engineered" Conveyors are planned and built to meet your special needs.

Buschman Conveyors

The E. W. Buschman Co., Inc.
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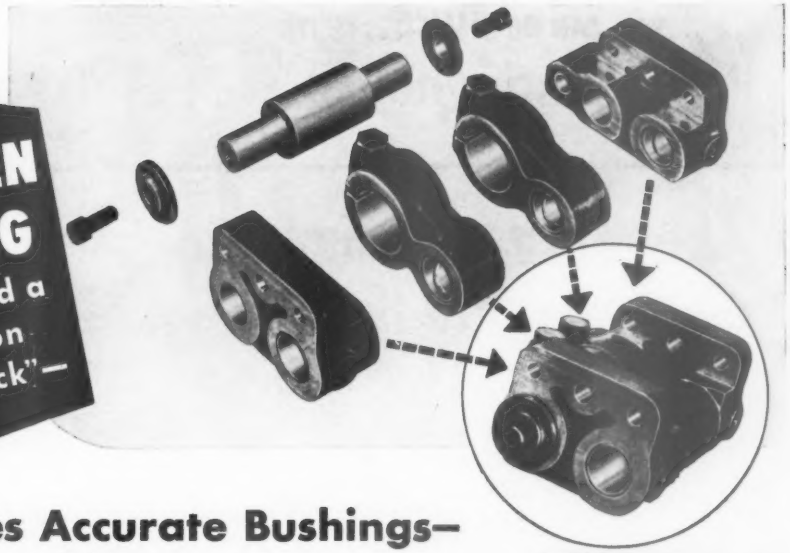
SUNNEN HONING Eliminated a Production "Bottleneck"—



Produces Accurate Bushings—in Perfect Alignment

...At C. B. Cottrell & Sons Co., Clavbourn Div., Milwaukee, Wisconsin

A unique problem at this company was to produce sets of four paper gripper bushings to exactly the same size — and mount the grippers in *perfect alignment, spaced on a long shaft.*

Production by lapping was slow — averaged one set of four grippers per day, but Sunnen Honing put this job on a high production basis.

By using a simple fixture (shown above), the four parts are now alignhoned to exact size in a matter of minutes. Better parts are produced at less cost, and they now meet production schedules with time to spare.

Many other applications in this company's plant prove the versatility of Sunnen Honing. Most applications require extreme accuracy, some are blind holes that must be straight and round — others are bushings that contain keyways. Sunnen Precision Honing Machines handle all of them, quickly and easily.

There may be similar applications for Sunnen Honing in your plant — just as there are in thousands of others.

WRITE FOR BULLETIN XMAN-5 for complete details — or request that a Sunnen engineer call at your plant.

SUNNEN PRODUCTS COMPANY 7959 Manchester Ave., St. Louis 17, Mo.
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Extreme accuracy on large diameter containing oil grooves

Geometrically true hole—free from bellmouth

Accurate alignment of two holes—with blind end

Smooth, straight, round hole produced in part with keyway

SUNNEN HONING

-402

"Low-cost production of precision holes"

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

STOP!

...have you planned your power distribution system?

Building a new production area? Everything laid out to do the job you've planned? Sure it is.

BUT . . . have you planned for the *best system* to power your new production lines? Their ability to produce depends directly on this power system.

Will your distribution system save you money *over a period of years?* Have you thought about *future* loads? Is it flexible enough to handle shifting production lines? Will it provide voltage regulation you need?

Whatever the problem—Westinghouse can help you find the "one best" system for *your* plant.

Our engineers have worked with *all types* of industries for a good many years. They have found new and better answers to *all* phases of power distribution. Westinghouse offers this co-operation to all Industry in getting power to do the best job at the lowest possible cost. J-94788

Here's REAL help for your "System Planning"

1. A new 34-page booklet: "Industrial Plant Distribution Systems", B-4045. Fact-filled pages and colorful diagrams present the basic systems most widely used in Industry today. Find how to choose the *best system* for *your* plant.

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When you need the right gear *in a hurry*

It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time*. To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

Next time a gear breakdown threatens a costly production tie-up, remember Grant's "in-the-pinch" service. Send today for free catalog of "In Stock" gears.

Reduction Units?
Grant has all types.
Write for catalog.

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Grant FOR GEARS

Ramps are only a few of the places where Ferrox should be used — *outside* your plant.

Your washroom is only one of the many places which require Ferrox — *within* your plant.

Accidents Involve People

. . . and they can involve you!

Do you know that slips and falls are responsible for about 20% of all compensation claims? And do you know how these can be greatly reduced?

Use non-slip Ferrox.* Wherever there's a slippery condition under foot, Ferrox can be quickly and easily trowelled-on . . . to prevent accidents under wet, dry, or oily conditions.

Ferrox was thoroughly tested and used by the Navy under the most rigorous conditions. In your plant, it may be applied to *any floor surface* — may be used in less than eight hours—and costs surprisingly little.

Why not take a walk through your plant and let your feet tell you exactly where you need Ferrox?

*Reg. U. S. Pat. Off.

Meanwhile, use the coupon below for complete information about low-cost, durable Ferrox.

FERROX

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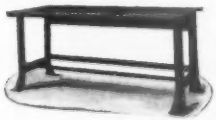
BASED on the average length of service of the men and women at SPS, there is actually more than 6000 *man-years* of solid, practical experience behind the SPS products that come out of this plant.

If we seem to brag a little, it is because we feel that most of what we have learned in the forty-six years we have been in business is of definite importance to you, the user of our SPS products.

For it is our collective experience in manufacturing, in design, research, development, merchandising, and every other phase of our business that enables us to furnish you products that are outstanding in their respective fields.

SPS products include: "UNBRAKO" Socket Screw Products, "FLEXLOC" Self-Locking Nuts, and "HALLOWELL" Shop Equipment of Steel.



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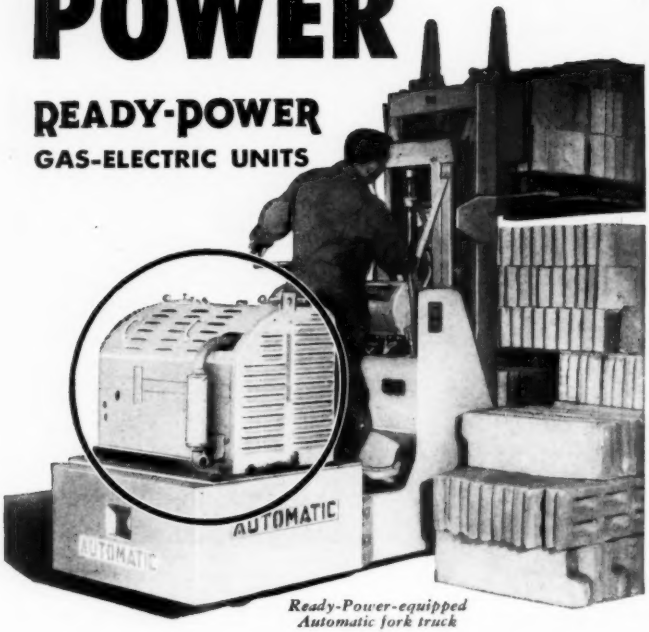
GAS-ELECTRIC UNITS



Ready-Power-equipped Automatic fork truck

There is only one way to provide plenty of power for an electric truck—wherever and whenever needed—and that's to generate it constantly right on the truck chassis. Ready-Power gas-electric Power Units do just that, and do it efficiently and economically hour after hour, day after day. Specify Ready-Power on new truck purchases. Write us direct for information on converting present equipment to Ready-Power.

Ready-Power-equipped Crescent platform truck with dump hopper

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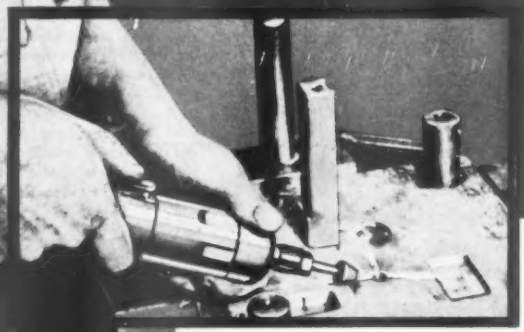
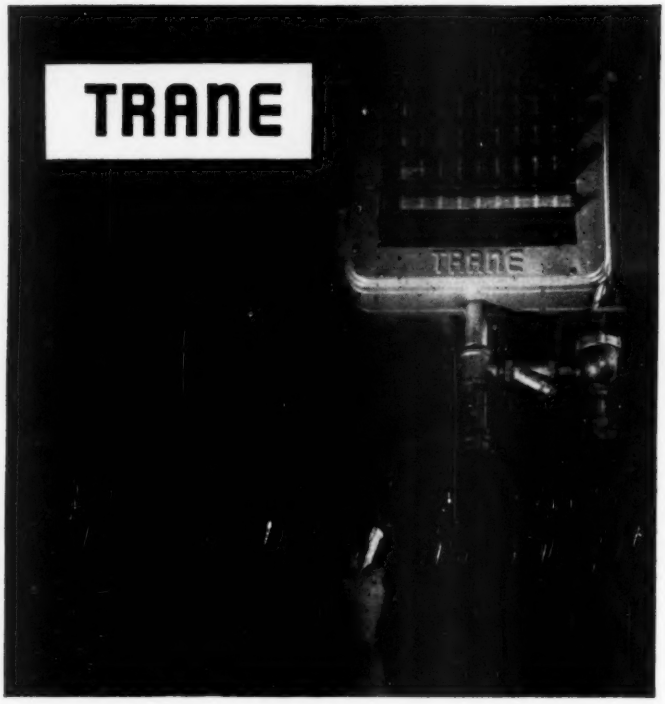


Available with ⅛ inch collet and Jacobs chuck for drilling. A tool post holder is also available for use in a lathe.

OTHER SKIL Pneumatic Tools for fast work include:

SKIL ELECTRIC Tools PNEUMATIC



Amazin' the amount of heat you get!

Tremendous heating capacity is only one of the "amazin'" facts about this trim new industrial heater. Equally amazing is its ability to stand punishment in line of duty.

What happens if the unit you plan on using at 15 pounds pressure accidentally gets 150 pounds instead? Such a change puts no strain on the Trane Model H, because it's built to meet every demand.

The secret is in Trane's "know-how" about coils. Coils for the Model H are weldless and solderless. Flat, plate-type fins, mechanically bonded to tubes, deliver full rated capacity *permanently*. Self-cleaning, they clear themselves of dust and lint.

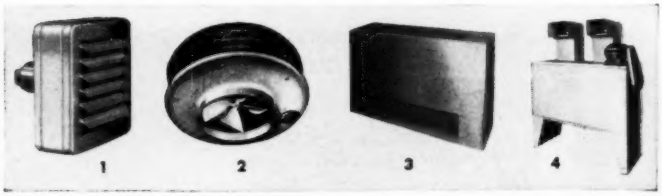
These coils are "floated" in the heavy furniture steel casing, requiring no expansion loops or other makeshifts to protect line and units against expansion and contraction.

Get details from your Trane sales office. The huge Trane line has the size and style that's right for you.

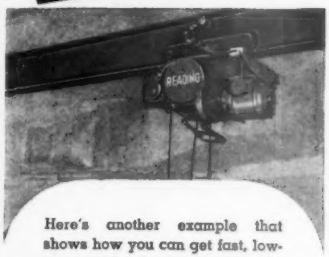
THE TRANE COMPANY, LA CROSSE, WIS.

Manufacturing Engineers of Heating, Ventilating and Air Conditioning Equipment—Unit Heaters, Convector-radiators, Heating and Cooling Coils, Fans, Compressors, Air Conditioners, Unit Ventilators, Special Heat Exchange Equipment, Steam and Hot Water Heating Specialties . . . IN CANADA, TRANE COMPANY OF CANADA, LTD., TORONTO.

Here are the "Four Freedoms" of unit heater selection: 1. *Twenty-four* sizes of horizontal units; 2. *Sixteen* sizes of vertical projection units; 3. *Twenty-four* combinations of compact force-flo heaters 4. *Sixty-eight* standard arrangements of blower units.

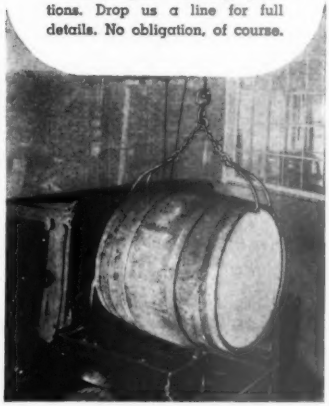


HOW ONE PLANT *Streamlines* MATERIAL HANDLING



Here's another example that shows how you can get fast, low-cost materials handling, right now. Before installing a *Reading* engineered system, this plant had to wheel heavy barrels to the mill via hand trucks. To streamline the operation, *Reading* Engineers were called in. A one-ton Reading Electric Hoist, operating on a built-in parallel trolley, was recommended. Now barrels move faster—less manpower is tied up—and the entire operation costs far less!

Let Reading Engineers give you *practical* suggestions that can streamline your handling operations. Drop us a line for full details. No obligation, of course.



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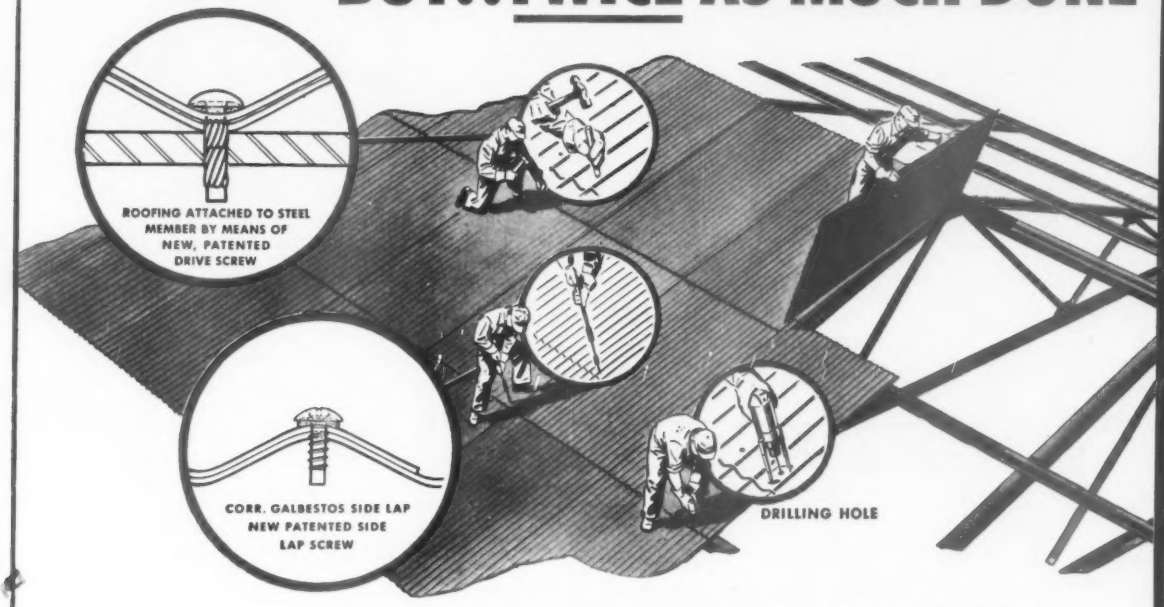
CHAIN HOISTS • ELECTRIC HOISTS
OVERHEAD TRAVELING CRANES

READING HOISTS

SAME NUMBER OF MEN
SAME AMOUNT OF TIME
BUT..TWICE AS MUCH DONE


ROOFING ATTACHED TO STEEL MEMBER BY MEANS OF NEW, PATENTED DRIVE SCREW
CORR. GALBESTOS SIDE LAP NEW PATENTED SIDE LAP SCREW
DRILLING HOLE

DO YOU KNOW GALBESTOS?

Robertson's protected sheet metal is steel with asbestos fused to it by metallic alloy. The fibers of asbestos are literally embedded in metal. So inseparable is this bond that Galbestos can be worked in ordinary sheet-metal shop equipment: crimped, rolled, sheared, bent and riveted like unprotected metal.

The asbestos is impregnated with asphalt, then waterproofed. Galbestos has been proved on installations all over the world to outlast any comparable material under the most grueling weather and industrial heat and corrosion. It virtually eliminates maintenance, which is actually continuation of first cost.

Galbestos comes in standard roofing and siding sheets up to 12 ft. long; maroon or black; flat or in several corrugations; for use over steel skeleton framework. Galbestos cuts cost of new building by saving large amounts of structural steel and other materials. It needs fewer purlins, less foundation.

Galbestos has been tested and classified by the Underwriters' Laboratories, Inc. and Assoc. Factory Mutuals Ins. Co's.

Would you like to see samples? Write for details.

Your own men can use Top-Speed Fastening*, a new method of attaching roofing and siding to steel frame. It's the first genuine means of cutting cost that has come out of the postwar.

Top-Speed Fastening uses a group of newly invented tools. But they're simple. And cheap. The system eliminates all interior scaffolding. So much time is saved that the same number of men in the same time can apply twice as much material.

That's big saving—and it's equally good on new construction or on repairs.

Now, here's another slant: Top-Speed Insulation* is a new method of applying insulation entirely from outside, before the sheeting is laid in place, again eliminating all interior scaffolding.

IF YOU USE TOP-SPEED FASTENING, THE TIME SAVED IS SO GREAT IT PAYS FOR THE LABOR NEEDED TO INSULATE. Therefore, you can, if you want, insulate merely for the cost of the material. Building Cost = Time + Materials. The only way to cut cost is to cut time or materials.

This ad cost a lot of money. We would waste it if we couldn't back it up! Write for the facts about TOP-SPEED FASTENING.

*patent applied for

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Offices in 50 Principal Cities
World-Wide Building Service

and the costs come TUMBLING DOWN!

WHEN YOU PUT THESE HUSKY LABOR-SAVERS TO WORK FOR YOU—

GO-GETTER POWER LIFTRUCKS

Pallet — Platform Skid — High Lift Models

Powerful, Battery Walk-along Low Cost Trucks that take the curse off innumerable moving jobs.

RED GIANT HAND LIFTRUCKS

Single, Two Stroke and Multiple Stroke Hydraulic Used daily in thousands of shops, factories and warehouses. Inexpensive, simple, long lasting

All Revolvator Products Roll on Timken Bearings

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Hand, Electric and Combination. Pile clear to ceiling and to any practical height. Revolvable and nonrevolvable bases.

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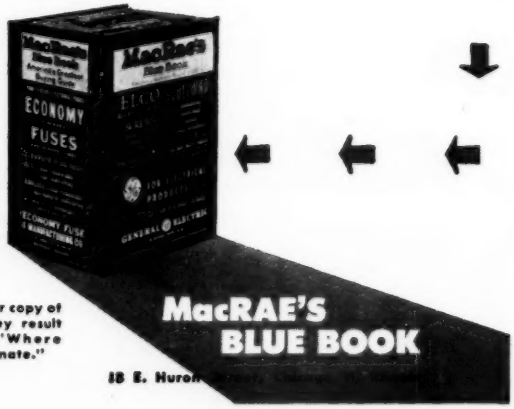
At 9 out of 10 of the largest and most important decision points in American industrial purchasing, MacRAE'S BLUE BOOK is used as a reference source "principally" or "exclusively."



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- *SIMPLE TO OPERATE*
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Only three simple acts are required to put these efficient communications systems into quick, positive action. They'll give you clear, distinct talking and ringing up to 20 miles — will serve you long and faithfully without maintenance trouble or expense.

Wheeler Self-Powered Telephones require no batteries or other power supply. Two wires connect the pair of standard size and quality telephone sets. They're compact, tough and convenient. See your jobber or write for descriptive booklet SA-8.

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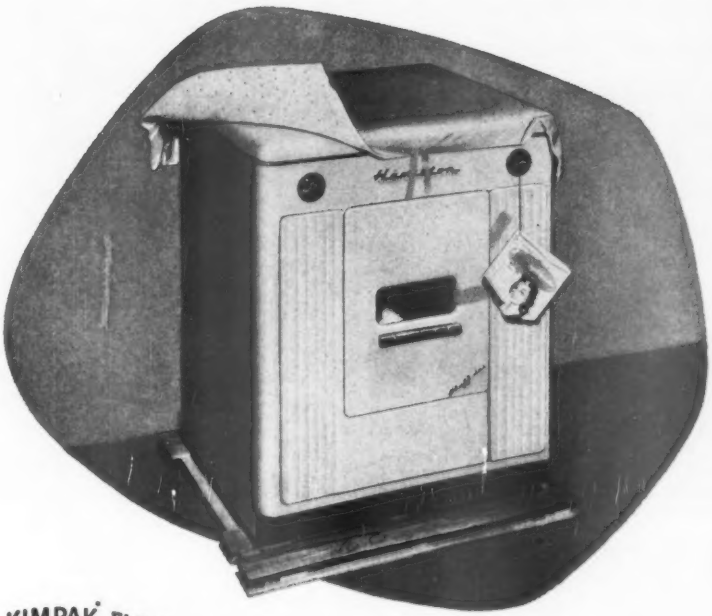
MAGNET WIRE • COILS • BALLASTS



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Cuts shipping costs— reduces damage in transit!

Now—give your product *better* protection—save money—and deliver a more presentable package. KIMPAK is so easy to apply, it saves dozens of man-hours in the packaging operation. Soft, resilient, flexible—KIMPAK adds little to the shipping weight. And so efficient, that complaints and rejects due to damage enroute are rare.

KIMPAK is versatile. Buy it in rolls, sheets or pads to suit your convenience. There's a specification to meet every requirement of the Four Basic Methods of Interior Packaging . . . Surface Protection, Flotation Packaging, Blocking and Bracing, Absorbent Packaging. At your first opportunity, test KIMPAK "Float Packaging"—and *save!*

PLEASE ACCEPT THIS FREE BOOKLET

"Float Packaging" will help you improve your packaging methods . . . and it's available to you at no cost. For your copy, simply call or write your local distributor, listed in the classified phone book under *Packaging Materials, Shipping, Wadding, Packing Equipment and Supplies*, or *Shipping Room Supplies*. Or use the coupon below.

Thick cushioning blanket of KIMPAK is laid over top of cabinet and down sides.

Kraft bag is pulled over the KIMPAK cushioning and down to the base.

Corrugated head cap and the sides of wire-bound crate are placed in position.

Completed shipping package affords protection from damage to surface of cabinet.

All photographs courtesy of Hamilton Manufacturing Co., Two Rivers, Wis.

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Please send me free, the illustrated KIMPAK packaging guide.

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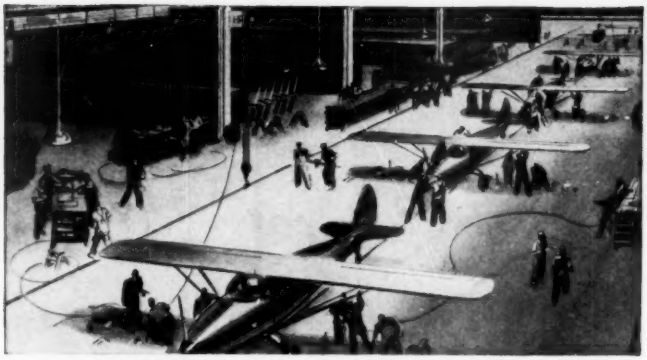
Seven new planes completed ...at a cost of $4.30!



New planes can't fly without control cable, and this manufacturer needed some—fast. He got it the same way he regularly gets many supplies and parts—by Air Express. Ordered in A.M., delivered to plant same day. 500 miles, 28 lbs., Air Express charge only $4.30. So production continued without a break.

$4.30 included pick-up and delivery at no extra charge—and receipt for shipment. All this, plus the *world's fastest shipping service*. That's Air Express—used with profit by every business.

Shipments go on all flights of Scheduled Airlines. Speeds up to 5 miles a minute—no waiting around. Direct service to over 1,000 airport cities, air-rail for 22,000 off-airline offices.

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Same day delivery in both cases if you *ship early*.

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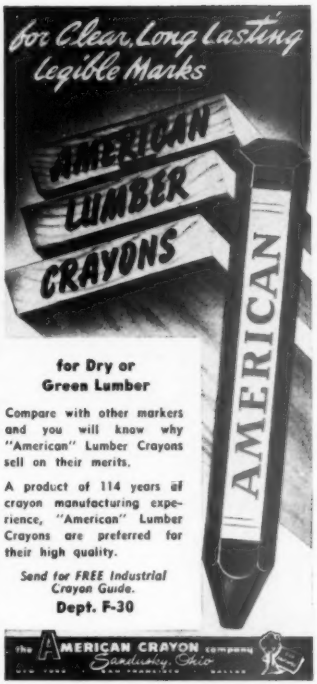

for Dry or Green Lumber

Compare with other markers and you will know why "American" Lumber Crayons sell on their merits.

A product of 114 years of crayon manufacturing experience, "American" Lumber Crayons are preferred for their high quality.

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Standard Equipment on America's finest Direct-Connected Machines

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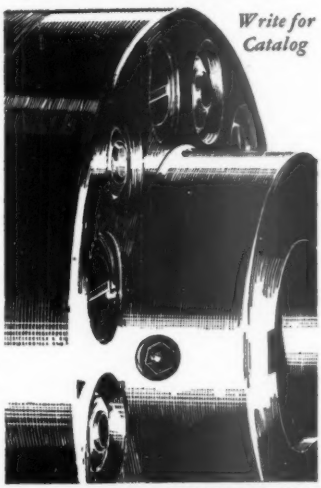

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WESTFIELD, NEW YORK

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they can be lowered by using

N-B-M No. 397 SILVER BABBITT

Yes, if you are interested in lowering costs of your plant operation or product, investigate N-B-M No. 397 Silver Babbitt.

You will find, *first*, that N-B-M Silver Babbitt costs from 30% to 40% less per pound than tin-base babbitt, and *second*, that it has all of tin-base babbitt's good performance characteristics:

- **Retains hardness at higher temperatures**
- **Easy to bond**
- **Has high corrosion resistance**
- **Embeds dirt and grit, even at room temperature**

More and more Plant Engineers and Product Designers are specifying N-B-M Silver Babbitt. Acceptance has been enthusiastic because of its durability and economy. Write today for quotations on this money-saving, long-lasting Silver Babbitt.

Ask for your free copy of this folder which describes N-B-M Silver Babbitt. Contains full information, physical properties and Engineering Briefs.

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PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

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Fast, mechanical cleaning removes ALL the grime, leaves smooth, easy-trucking surface.

PERFORMS 3 OPERATIONS

1. **CUTS GRIME LOOSE** with high-speed steel wire brush or Revo-tool.
2. **SMOOTHS, LEVELS** surface, leaving floor hard, dry, ready for traffic.
3. **PICKS UP SOILAGE** to eliminate need for sweep-up.

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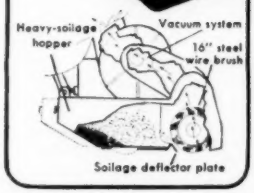

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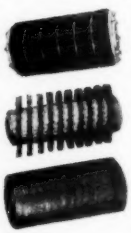

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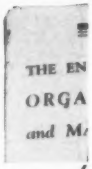

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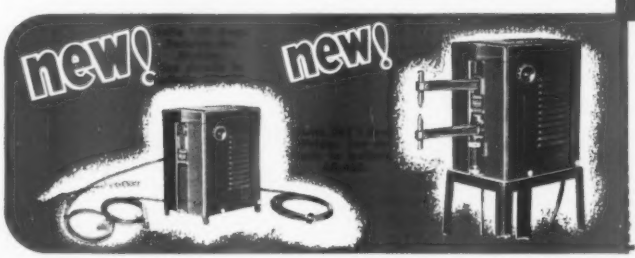

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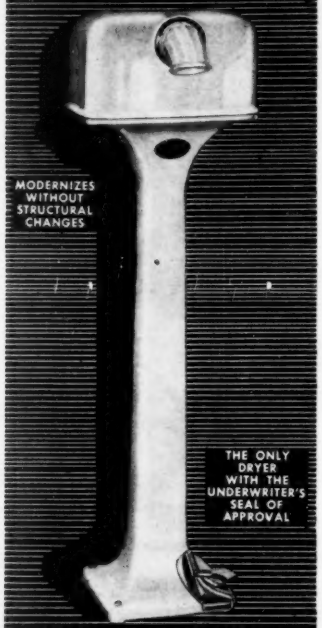

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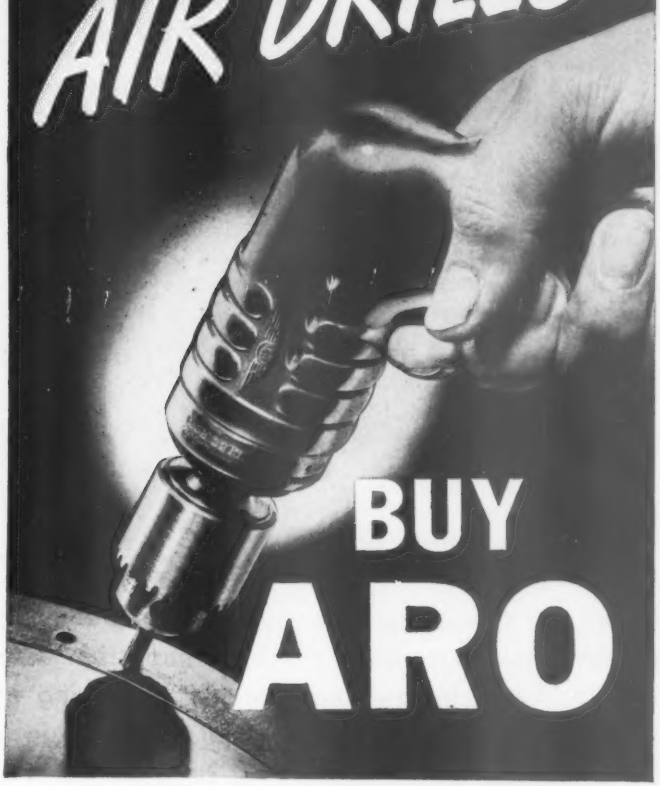

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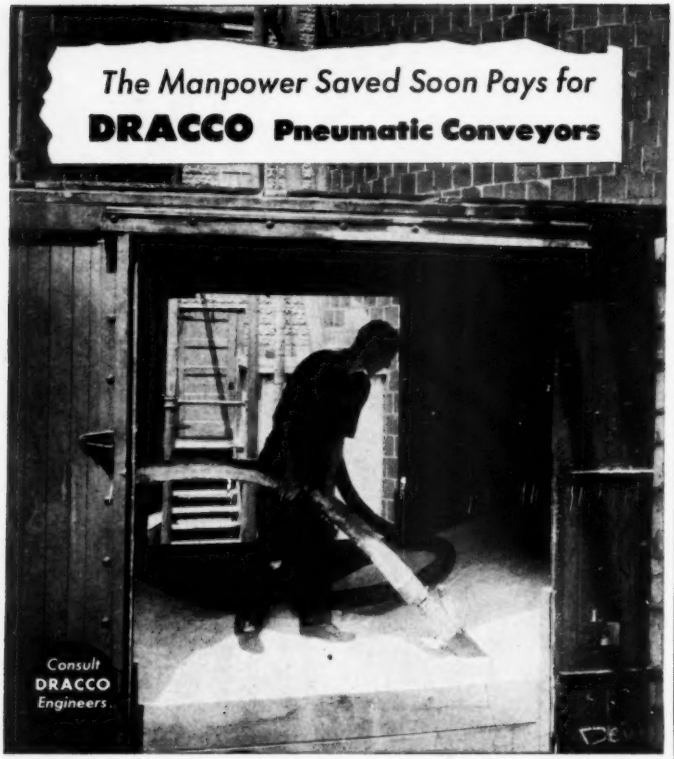

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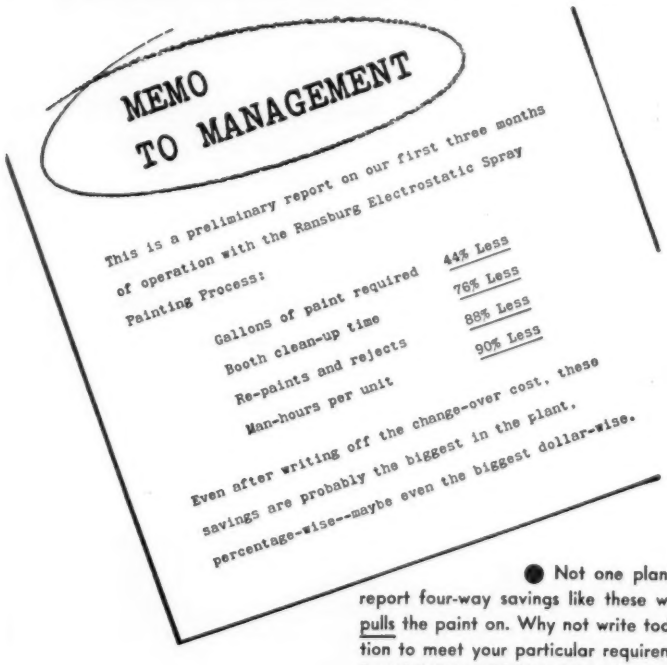
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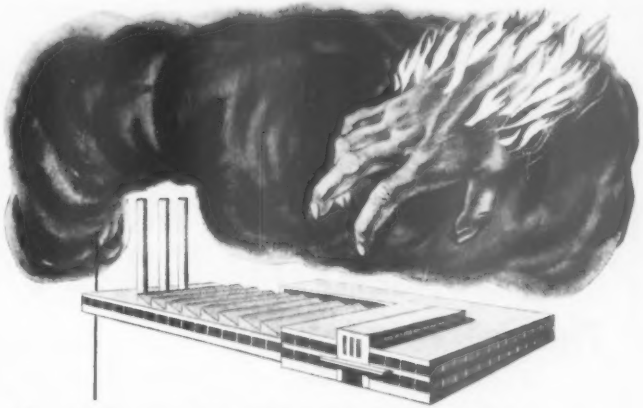

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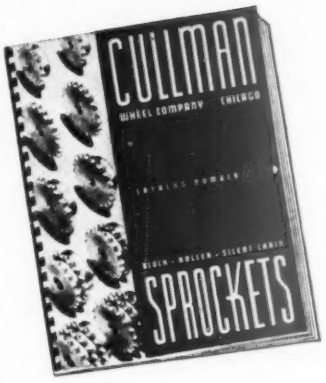

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Cullman Wheel's new catalog, comprising eighty pages of unusually instructive data is yours for the asking. Rarely has been such a mass of instructive technical data on sprockets, block, roller, silent chain and speed reducers produced in catalog form. In addition to thirty pages containing photographs, are some seventy pages of elaborate specification tables for quick buying reference. Better send for it at once!

Cullman Wheel Company also produces a line of Speed Reducers for motors from ¼ to 15 H. P.

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WHEEL COMPANY

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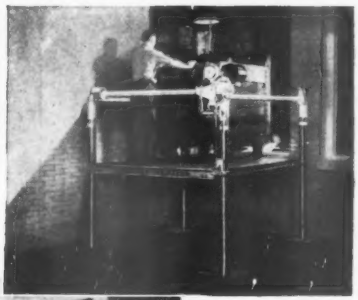
117-C

man-saver

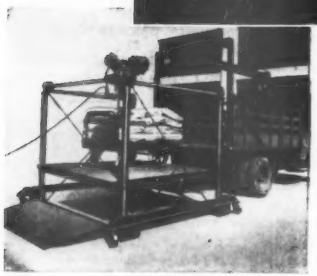
Handles your heavy loads from level to level

Safely-Easily

NEW SERVICE LEVELER



Simplifies movement of factory trucks between two floor levels



Portable model at additional cost—can be moved to facilitate loading and unloading of trucks in factory yard, etc.

Save your workers a lot of backaches—save time, trouble and money, by handling heavy loads from level to level with the new Service LEVELER. Dependably powered by a ruugged, fully-enclosed, 1 H.P. motor, it lifts as much as 6,000 pounds as high as 5 feet . . . in less than a minute. Loads, machine and operator are fully protected under all operating conditions. Outstanding safety features include: easy manual control of starting and stopping at any height; automatic top and bottom limit stops; positive motor cut-off stops; centrifugal safety governor; slack cable shut-off; post guard rings. Here's a unit that can be installed anywhere in just a few hours at amazing low cost . . . requires no sub-surface installation . . . obsoletes slow, dangerous manual handling . . . pays for itself in a very short time. *Write for detailed specifications today.*

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Known for their dependable performance under the most severe operating conditions, Clark Steam Traps are typical examples of the products available through Hajoca. It is the wise buyer who calls Hajoca *first* for industrial maintenance and operating supplies.

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Your Name_____

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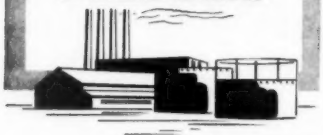

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Many of America's most progressive industrial organizations are standardizing on Far-Air Filters. Laboratory and field tests conducted under varied conditions have proved their superiority — *herring-bone-crimp* construction assures dependable higher performance and lower maintenance costs.

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A well-equipped testing and development laboratory is maintained for research in all types of filtration problems. Farr engineers are available in your territory to serve you. Write Farr Company, Los Angeles 43, Calif.

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Extra Safe...

FOR MAINTENANCE WORK

Safety PLATFORM LADDER

This ladder of many uses was designed to eliminate hazards usually found in ordinary step ladders. Broad platform allows working in any direction with both hands free. Rung back can support helper or staging between two ladders. Made of the finest selected ladder stock to last years longer. Eight sizes with platform heights from 4' to 18'.

NEW
Single and extension ladders made of MAGNESIUM

MANUFACTURERS OF
Ladders, Safety Swinging Scaffolds and other safety-off-the-ground work equipment.

BRANCH OFFICES: Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles Miami • Milwaukee • Philadelphia • Pittsburgh • San Francisco • Seattle • St. Louis

GOLD MEDAL LADDERS SCAFFOLDING

FOR GREATER SAFETY . . . EFFICIENCY . . . ECONOMY

THE PATENT SCAFFOLDING CO., Inc.

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Extended, heavy steel side plates protect sheaves
Heavier pins and axles
Tough steel reinforcing straps
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9301

Dropped, slammed and battered on the job, blocks and sheaves have to be *tough!* Compare AMERICAN *"armored construction"* . . . see why these blocks and sheaves serve better, last longer. Many types, all sizes, from 1½ to 250 tons, for wire rope only. Sold by distributors everywhere. Made by AMERICAN HOIST AND DERRICK CO., St. Paul 1, Minn.

ALSO MAKERS OF THE AMERICAN HANDIWINCH AND GENUINE CROSBY CLIPS

ASK FOR AMERICAN BLOCKS AND SHEAVES

Important Questions..

about iron and steel scrap for every top business man in every industry

Q. *How* **bad** *is the shortage of scrap?*
A. Actually, we have enough scrap to get along, but too much of it is *light* scrap. What is badly needed today is more *heavy* scrap.

Q. *Why more* **heavy** *scrap?*
A. Because heavy scrap will produce *more and better* steel in *less* time.

Q. *Why is the heavy scrap shortage so* **harmful** *to our economy?*
A. Half of all the ingredients that are melted to make steel and castings consists of scrap iron and steel. The short supply of heavy scrap during the past year limited the production of steel mills and foundries. At the present record rate of production, there is still not nearly enough steel to meet the current and anticipated demands of our domestic economy, military requirements, and ERP. More heavy scrap will help bridge the gap.

Q. *What's being* **done** *about it?*
A. A drive . . . and everybody is cooperating . . . is being started for industrial scrap, to (1) help step up present steel production, and (2) *create a visible reserve of heavy scrap in the event of national emergency.*

Q. **Why** *is there a shortage of heavy scrap?*
A. Several reasons:

1. Very little of the 123,000,000 tons of steel and steel products exported during the war has come back as scrap.
2. With replacements scarce and expensive, much old equipment which would normally have been junked by now, is still in use.
3. A halt has been called on the junking of old vessels and military equipment which has until recently been a source of scrap.
4. The amount of heavy scrap produced in fabrication —the left-overs of machinery, etc.—is not enough to meet the demand for new steel and castings.

Q. *How about the heavy scrap that must exist in huge quantities in* **Germany** *and* **Japan?**
A. Some of this will be coming through, but not in good quantities until preparation and transportation facilities within those countries improve.

Q. *Where can* **additional** *scrap be obtained from domestic sources?*
A. From industrial plants which have on hand large amounts of heavy scrap in the form of obsolete machinery, idle equipment—tools, dies, jigs, fixtures, etc.—and unnecessarily large repair parts inventories. Such scrap is the best possible type for the manufacture of quality steel.

Q. *Isn't such material* **ordinarily** *turned in as scrap?*
A. Experience shows that plant "housekeeping" is not particularly good when plant production is high. People are too busy. However, if executives realized the critical situation, they would order the necessary steps to be taken.

Q. *How can I help in this drive?*
A. Appoint one top official in your plant as a Salvage Director —with full authority to give orders and throw out everything that is not going to be needed. Have him consult with your trade association's Steel Scrap Drive Committee. Call in your local scrap dealer. (Incidentally, the prices paid for scrap are the highest ever.) Promote your scrap drive by meetings of department heads and through plant bulletin boards and newspapers.

Q. *How do I benefit from moving scrap in addition to the money received for it?*
A. 1. You get the use of much-needed and expensive floor space now occupied by such equipment and material.
2. You eliminate the cost of keeping records and inventory.

Q. *When does the scrap drive* **start**?
A. Right this minute. The very next thing to do after reading this page, should be to start *your* plant's scrap drive!

Q. *What is the goal of this drive?*
A. One million tons of *heavy* scrap . . . and "housecleaning" in your plant will help.

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL ·

SCRAPPY SAYS:
Search your plant for HEAVY SCRAP ...Help make MORE STEEL!

FACTORY MANAGEMENT and MAINTENANCE

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This booklet gives the necessary information to plan and formulate a master key system scientifically. It shows how to make up charts and how to prepare a faultless system that can be serviced easily. Easy to understand, well illustrated, compact for easy reading.

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supplements other advertising in this issue with these additional announcements of products and services essential to modern plant management and maintenance. Make a habit of checking this page, each issue.

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FACTORY MANAGEMENT & MAINTENANCE

Valuable Help for You

and your

SUPERVISORY STAFF

in

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Reprints of some of FACTORY'S best recent articles on a wide variety of

PRODUCTION, MAINTENANCE AND LABOR SUBJECTS

For complete list see page 305

FACTORY MANAGEMENT AND MAINTENANCE

"HOLY MOSES... there's something I never knew before!"

F—11A

Unless you're exceptionally well-informed there are probably lots of things YOU never knew before right here in the advertising pages of this magazine.
Alert manufacturers use these advertising pages to get the *news* about their products and services to you . . . quickly and effectively.
Their advertisements contain information designed to help *you* do your job better, quicker and cheaper.
To be well-informed about the latest developments in *your* industry . . . and to stay well-informed . . . *read all the ads too.*

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Now 33⅓% TO 50% MORE STRENGTH and LONGER LIFE

Genuine PITTSBURGH GEAR

TAPER SERRATED SHAFTS and PINIONS

If you're plagued by repeated breakage of shafts and pinions switch to Genuine Pittsburgh TAPER SERRATED SHAFTS and PINIONS. No more old-fashioned, weakening keys and keyways. Full metal strength preserved. Shafts and pinions V-LOCKED all around. Shock-proof. Can't shake loose . . . yet easy to apply or remove.

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Another Detecto Scale that protects your profits. With the Detecto Post-O-Meter, you just press a key and get one precise to-the-penny magnified figure. Thermolastic spring compensates for temperature changes.

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MAKERS OF FINE SCALES SINCE 1900

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ENGINEERS: AN electrical engineer, a mechanical engineer, and an architectural engineer. Graduates, with a minimum of 5 years experience. Designing ability required. Please furnish: references, recent photograph, resume of experience, education data, and sample of work. Permanent position. Write P-8037, Factory Management & Maint.

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SALARIED PERSONNEL $3,000-$25,000. This confidential service established in 1927 is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. D, 241 Orange St., New Haven, Conn.

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EXECUTIVES. THIS confidential exchange, now in its 19th year of service to High Grade Employees specializes in individualized personal service to its clients, in opening contacts and negotiating for satisfactory salaried positions. Eugene L. Williams, P.O. Box 138, Richmond, Va.

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(Continued on opposite page)

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Wanted by a well known, established, progressive manufacturing company making small electrical mechanical products. Prefer college graduate under 45 years old. The man we want must have a background in the management of a successful manufacturing business and have a complete knowledge of production. Should be able to assume responsibility and be next in line to the corporation president. Our own organization knows of this ad. All replies strictly confidential.

P8043 Factory Management & Maintenance
330 West 42 St., New York 18, N. Y.

WANTED — AN EDITOR

Somewhere among FACTORY's readers there is a man equipped by experience and inclination for an editorial job on a leading management magazine. He must be a college graduate either in electrical or mechanical engineering. He must be familiar with the maintenance problem in industry and must have had several years' experience in the maintenance department of some plant in the manufacturing industries. He must be anxious to get into editorial work because it offers an opportunity for broader outlook and service to industry. Age 30 to 45. Salary commensurate with experience and ability. Location, New York City.

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Desiring Positions with Stability

We solicit inquiries from qualified candidates who desire to contact employers for positions paying $5000 to $25,000 per year. Confidential. Est. 34 years.

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MANUFACTURERS REPRESENTATIVE

Seeking Additional Lines. Excellent connections in Great Lakes area through General Motors, Ford, Chrysler and others.

Reply:

RA-7957, Factory Management & Maintenance
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(Continued from opposite page)

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PLANT MANAGER, steel products or other, to be available. Established or branch plant or enterprise. PW-7376, Factory Management & Maint.

INDUSTRIAL ENGINEER with production supervisory experience, 49 years old, 25 years experience in automobile, truck tractor, and airplane parts plants, both in U.S.A. and abroad. Capable supervisor and skilled in standards setting and administration. PW-6056, Factory Management & Maint.

MANAGEMENT IN Manufacturing, either General or Departmental. Sixteen years experience as General Manager in mid-west factory specializing in moderately small metal and wood products employing up to 400 people. Have also functioned as Purchasing Agent, Production Manager, Sales Coordination and Personnel Manager including union contract negotiations. College Graduate, married, two children, age 44. No preference in location. PW-7887, Factory Management & Maint.

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ASST. PLANT SUPT.—39, comprehensive understanding of industrial activity. Automotive equipment, aircraft, heavy fabrication and hardware experience. Available now in Chicago. PW-7378, Factory Management & Maint.

METHODS ENGINEER 15 years experience in optical and mechanical processes plant layout, wage incentives, jov evaluation applied to spectacle frame, camera and instrument industries—broad background in cost reduction, administrative responsibilities. References. PW-7938, Factory Management & Maint.

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For Sale—A complete Fostoria

Even-Ray System for baking, drying, pre-heating, dehydrating—practically new. Consists of four banks of units, each unit 12 ft. long—6 ft. high, with floor stands and controls. Each bank has magnetic contractors and six-second time interval delay-relay. Includes 576 lamps, 375 Watts each, total 216,000 Watts or 216 KW. Adaptable to all production line needs, 48 ft. of radiant energy on each side. This equipment to be sacrificed at a substantial saving. Write BO-8084, Factory Management & Maint.

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Time Study Forms,

boards, stop-watches. Forms shipped from stock, or your forms duplicated. Write for prices. Oznam Products, 5542 So. Homan Ave., Chicago 29, Ill.

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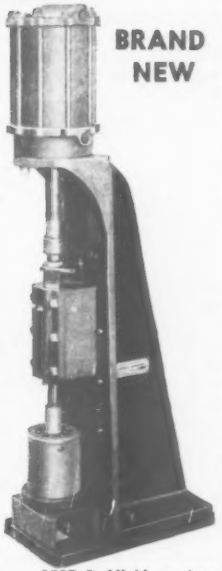
Double-Action

Pneumatic-Hydraulic

PRESS

$300.00 value offered at a fraction of original cost.



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Using air or oil, this device is ideal as a punch press, vise, arbor press, etc. An excellent tool for industrial and shop use.

Use 150 lbs. of air pressure or 250 lbs. of oil pressure. Cushioned double action "Logan" Model AC ram, 6" bore and 6" stroke. Capable of up to 4200 lbs. of pressure, using air.

Has 3" throat. Lubricated gibs provide perfect alignment. Has adjustable work space. Hardened alloy steel piston rod 1" diameter.

Frame constructed of cast steel with ¾" base plate. Manufactured by Sipp-Eastwood Company. Unit is 49" high. Base is 9½" wide, 18" deep. Wt. approx. 300 lbs.

AN OUTSTANDING BUY AT $79.50

F.O.B. Chicago

Send Payment or Purchase Order Today!

SATISFACTION GUARANTEED!

GROBAN SUPPLY CO., Dept. FM-3, 1507 S. Michigan Ave. Chicago 5, Ill.

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12—	5	KVA W-H 13200-120/240
4—	10	KVA W-H 13200-120/240
3—	25	KVA W-H 13200-120/240
3—	25	KVA Mol 13200-120/240
10—	37½	KVA W-H 13200-120/240
2—	25	KVA W-H 13200-2400
2—	37½	KVA Mol 13200-2400/4160Y
3—	75	KVA W-H 13200-120/240
3—	75	KVA G-E 13200-120/240
1—	75	KVA Mol 13200-2400
1—	100	KVA W-H 13200-2400
10—	1½	KVA Wag 7200-120/240 "REA"
4—	5	KVA W-H 2400/4800-120/240
4—	7½	KVA W-H 4800/8320Y-120/240
3—	50	KVA W-H 4800/8320Y-120/240
3—	50	KVA G-E 26400-2300/4000Y
3—	50	KVA G-E 33000-2400/4160Y
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1—Gas Fired Recirculating Young Bros. DRYING OVEN, 2 Compts., complete with controls.

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Rewind and repair service on all makes of transformers.

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New & Guaranteed Rebuilt

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For Standby Service or Demolition Work

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New SEARCHLIGHT Advertisements

received by March 18th will appear in the April issue, subject to space limitations.

Classified Advertising Division
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330 W. 42nd St., New York

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For All Purposes

IMMEDIATE DELIVERY

Warehouse and Fabricating Facilities

Write — Phone — Wire

LONG ISLAND BEAM CO.
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STillwell 6-5900-1-2-3

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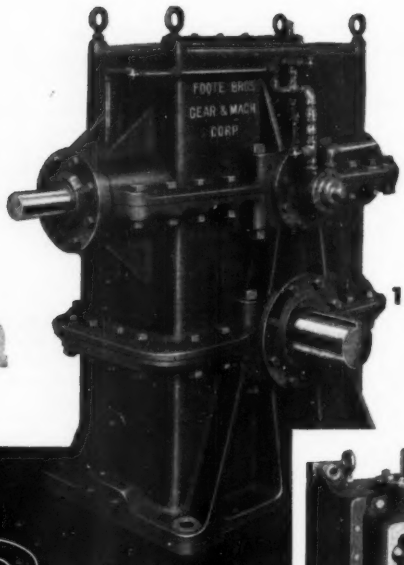

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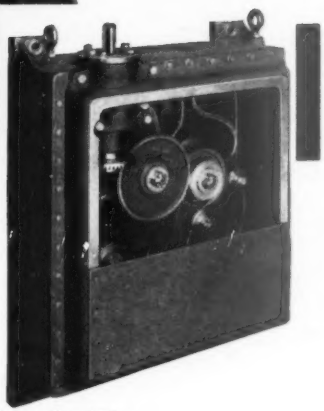

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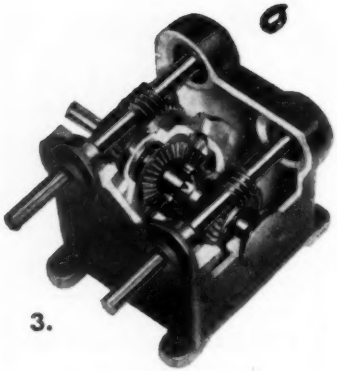

3.

One of the services Foote Bros. renders industry is the production of drives such as these shown here to meet individual needs.

1. Here is a giant gear reduction unit engineered to stand the pounding, crushing force necessary in the production of asphalt tile.
2. Here is a textile mill drive that not only provides a number of shaft speeds, but also permits gear ratios to be changed quickly.
3. Here is a small, compact unit that permits a quick change from forward to reverse on a predetermined time cycle.

If you are now using special drives on the equipment you manufacture, be sure to investigate the facilities of Foote Bros.' large plants completely equipped to produce gears and drives to meet practically any need.

If you are faced with a problem in the design of gears or transmission equipment, Foote Bros. engineers will gladly assist you in finding the correct solution.

Of course, Foote Bros. also can furnish a complete range of standardized speed reducers to meet almost any industrial need. The more popular sizes and ratios are available from stock.

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Dept. I, 4545 South Western Boulevard • Chicago 9, Illinois

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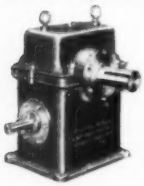
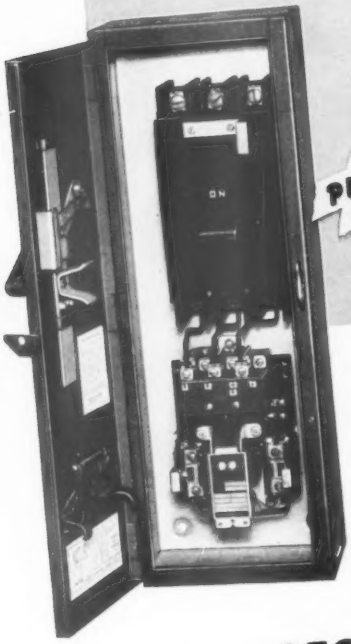


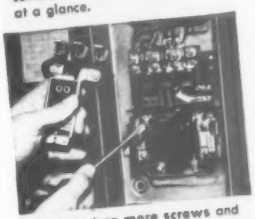
GET COMBINATION STARTER ADVANTAGES PLUS ACCESSIBILITY



COMBINATION STARTERS are increasing in popularity because they are safe, easy to install, take less space and have good appearance.

In addition to these advantages, Square D Combination Starters, with either front-operated switches or Thermal-Magnetic (Coilless) circuit breakers, feature magnetic starters that are accessible.

Loosen two screws and the arc chamber cover comes off. Every contact surface can be inspected at a glance.



Remove two more screws and entire armature and movable contact assembly can be lifted off. Disconnect two wires from screw-type terminals and slip off magnet coil.

Contacts are attached with separate screws—can be removed and replaced without disturbing any wiring. Screw-driver is only tool needed.

Even the *BEST* Motor Starters Need Inspection and Maintenance

ALL starters require periodic contact replacement under conditions of heavy load or frequent operation. Some may require magnet coil exchange to match voltage and frequency of power supply. That's why Square D has always stressed accessibility—simplifying installation, inspection and normal maintenance.

New "Off-the-Shelf" Parts Kits make normal maintenance easier than ever!

Now, replacement parts for Square D starters are packaged in easy-to-stock kits. Each kit contains parts necessary to replace all load contacts on two or three-pole starters. Parts are individually packaged in clearly labeled envelopes. Illustrated service bulletin is enclosed for quick parts identification and complete installation instructions.

Write for Combination Starter Bulletin 8538 and Parts Kit Bulletin 9998. Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

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TIMKEN® bearings help make Skylift Giant strong enough to lift a freight car

HERE'S a demonstration that's a tough test even for a heavy duty lift truck like the Automatic Skylift Giant. It's a tough test, too, for the truck wheel bearings, which carry the full weight of this amazing load.

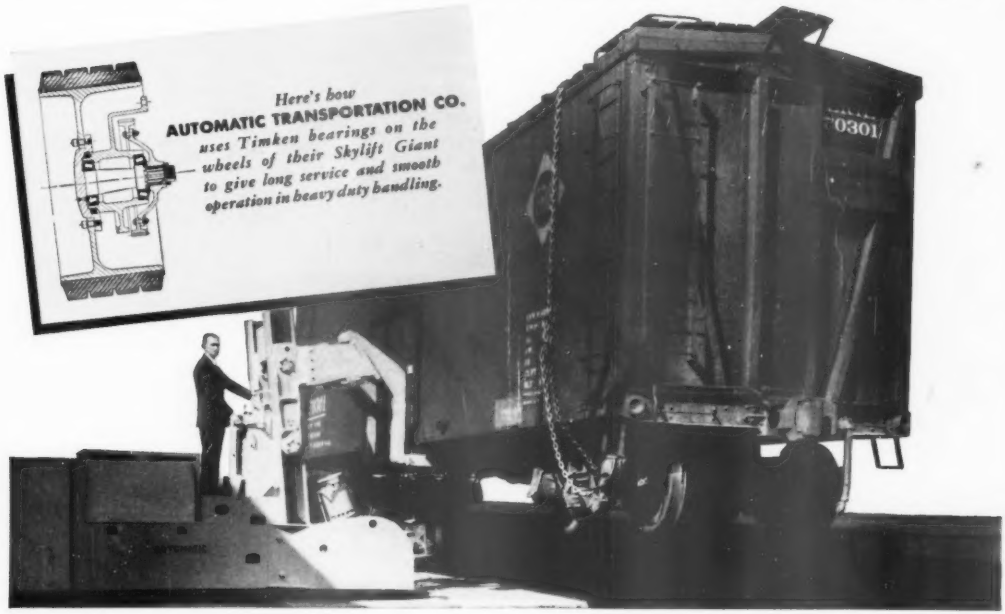
For long service in exceptionally heavy duty shop work, the Automatic Transportation Company equips the wheels of its Skylift Giant with Timken® tapered roller bearings.

Due to the line contact between the rolls and races, Timken bearings have tremendous load-carrying capacity. What's more, because of their tapered construction, they carry loads from every direction—radial and thrust, in any combination. Their true rolling motion and incredibly smooth surface finish enable Timken bearings to operate freely and frictionlessly.

Timken bearings are made of heat-treated Timken alloy steel—the finest, toughest steel ever developed for tapered roller bearings. They're case-hardened for extra resistance to wear and finished with microscopic accuracy. Normally, a Timken bearing lasts as long as the machine in which it is used.

Be sure that you have Timken bearings in all the equipment you make or buy. Look for the trademark "Timken" on the bearing—it is an assurance of bearing quality that is recognized the world over. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This label on a product means its bearings are the best.


Here's how
AUTOMATIC TRANSPORTATION CO.
uses Timken bearings on the wheels of their Skylift Giant to give long service and smooth operation in heavy duty handling.
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TIMKEN BEARING CAPACITY RATINGS INCREASED 25%.

Since Timken bearings were last re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

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